STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

REPORT OF EXAMINATION
TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

☒ Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

☐ Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
September 15, 2002	S2-29934		

NAME			
Puget Sound Energy Inc			
ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
PO Box 97034 Mailstop OBC-14N	Bellevue	Washington	98009-9734

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Lake Tapps

TRIBUTARY OF (IF SURFACE WATERS)
White River

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE FEET PER YEAR
150		72400

QUANTITY, TYPE OF USE, PERIOD OF USE

61400 Acre-feet per year	Public Water Supply (Including Industrial & Commercial)	Year-round, as needed
11000 Acre-feet per year	Source Exchange (Public Water)	Year-round, as needed

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION--WITHDRAWAL
Final intake location to be determined.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
SW¼ NE¼	8	20	5E	10	Pierce

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

The POU includes all King County UGA’s and Utility Service Areas identified in the Central Puget Sound Regional Water Supply Outlook (Outlook), the Pierce County UGA’s and Utility Service Areas in the Outlook except the Cities of Dupont, Eatonville, Roy, the Fort Lewis and McChord military bases, and the McKenna, Southwood, Graham Hill, Eldorado, and Chinook water systems. The POU also includes the Olympic View Water District in Snohomish County that is partially supplied by the Seattle Public Utilities (SPU) and the Gig Harbor peninsula.

DESCRIPTION OF PROPOSED WORKS

Lake Tapps Water Supply Project.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
December 31, 2016	December 31, 2024	December 31, 2036
December 31, 2016 (Phase II)	December 31, 2040	December 31, 2053

REPORT

See attached

09/22/06
Report of Examination
Lake Tapps Reservoir Water Supply Project Application
S2-29934

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Definition
af/y	acre feet per year
BOD	Biochemical Oxygen Demand
CAFO	Confined Animal Feeding Operation
CELP	Center for Environmental Law and Policy
cfs	cubic feet per second
CFU	colony forming unit
CWA	Cascade Water Alliance
DMP	Diversion Minimization Plan
DO	dissolved oxygen
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
ft msl	feet mean sea level
GMA	Growth Management Act
IFIM	Instream Flow Incremental Methodology
MDNS	Mitigated Determination of Nonsignficance
MGD	million gallons per day
MIF	Minimum Instream Flow
MIT	Muckleshoot Indian Tribe
MOU	Memorandum of Understanding

NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	NOAA Fisheries Service
Outlook	Central Puget Sound Regional Water Supply Outlook
PIE	Pacific International Engineering
POU	Place of Use
ppt	parts per thousand
Program	Source Exchange Program
PSE	Puget Sound Energy
PTI	Puyallup Tribe of Indians
Q	flow
QA	total annual volume
QI	peak instantaneous flow
ROE	Report of Examination
SEPA	State Environmental Policy Act
sfd	second foot day
SPU	Seattle Public Utilities
TM	Technical Memorandum
TPU	Tacoma Public Utilities
TSP	Transmission and Supply Plan
TSSP	Tacoma Second Supply Project
UAA	use attainability analysis
UGA	Urban Growth Area
U.S.	United States
USACE	U.S. Army Corps of Engineers
USGS	United States Geological Survey
V	lake volume
WDFW	Washington Department of Fish and Wildlife
WDOH	Washington State Department of Health
WRIA	Water Resources Inventory Area
WSP	water supply project
WUA	Weighted Useable Area
7Q10	10-year, 7-day low flow
7Q20	20-year, 7-day low flow
θ	theoretical residence time

1.0 INTRODUCTION

Puget Sound Energy (PSE) owns the lands and works of the former White River Hydroelectric Project in Pierce County. The project was in operation from 1911 until January 15, 2004, and during that period diverted up to 2000 cubic feet per second (cfs) of water from the White River into Lake Tapps Reservoir. The diverted water was stored in Lake Tapps and released through a power-generating facility to the White River via a tailrace 20.7 miles downstream from the point of diversion. The portion of the White River between the diversion and the tailrace is primarily located within the Muckleshoot Indian Tribe Reservation and is referred to as the "Reservation Reach" (also referred to as the "bypass reach").

These historic hydroelectric operations greatly reduced flows in the White River between the diversion and the tailrace, resulting in significant impacts to fisheries and water quality. Prior to 1980, there were no minimum instream flow rules in effect for the White River. In 1980, the State Department of Ecology adopted by rulemaking an Instream Resources Protection Program for the Puyallup River Basin including the White River. Because the White River project water right predated the instream flow rule it was not required to comply with the flows established in the rule for the lower Puyallup River. The rule also "closed" the White River to any further appropriations but did establish numeric flows for that river as was done for the Puyallup River. A settlement agreement between PSE and the Muckleshoot Indian Tribe in 1986 established a minimum instream flow for the White River Reservation Reach of 130 cfs.

At the time the hydroelectric project was developed, the land surrounding Lake Tapps was rural pasture and woodlands. By the 1990's, Lake Tapps was surrounded by homes, a popular county park had been created, and the Lake and park had become a significant resource for boating and swimming and aesthetic enjoyment. In 1985 the FERC required relicensing of the hydropower project.. The relicensing process became highly contentious over resource issues. In 2000, PSE applied for public water supply/municipal water rights at the project and in 2001, PSE began negotiations with the Cascade Water Alliance (CWA) to sell such water rights and the project facilities to CWA. CWA represents a consortium of municipalities seeking to solve future water supply needs in the growing Puget Sound urban area. In 2001, PSE entered into a Memorandum of Understanding (MOU) with CWA. The MOU offered CWA the opportunity to purchase Lake Tapps, the hydroelectric project, and PSE's water right for the purpose of developing a regional water supply. In January 2004, PSE discontinued power generation and in 2006 CWA and PSE signed an agreement for CWA to purchase the project, contingent upon PSE obtaining a municipal water right for the project, among other factors. Since closing the hydropower project, PSE has continued to divert water as needed to maintain Lake levels in Lake Tapps and has released water from the project back into the river as a flushing or pass through flow for the purpose of maintaining water quality.

In response to the water rights applications, the Washington State Department of Ecology (Ecology) has examined the facts associated with operating the project for municipal water supply and prepared this Report of Examination (ROE). To approve the water right applications, Ecology must issue written findings of fact and determine that each of the following four requirements of RCW 90.03.290 has been satisfied:

1) Water is available for appropriation;
2) The proposed appropriation would be put to a beneficial use;
3) The proposed appropriation would not impair existing water rights; and,
4) The proposed appropriation would not be detrimental to the public interest.

This ROE first describes the proposed project and the water right applications filed. Second, it presents Ecology's investigations that form the basis of the decision. Third, it separately evaluates each of the requirements of the four-part test. Finally, it presents the written findings of fact and the decision.

This Report of Examination recommends that the permit be issued subject to higher minimum instream flows, for fisheries and water quality purposes in the White River, and other conditions that provide public benefits and protections to the instream resources. The report concludes that the new project would:

- Provide a water supply to meet projected demands over the next 30-50 years within the service area of the CWA members and could additionally provide a backup water supply for other municipal providers in the region.
- Provide new minimum instream flows for threatened fall and spring run White River Chinook Salmon.
- Reduce existing impacts to impaired salmon streams by requiring CWA members to use water from the project to replace existing sources impacting such streams.
- Maintain Lake Tapps for the homeowners who have invested in their homes with the reasonable expectation that they will continue to enjoy future lake recreation.

2.0 DESCRIPTION OF THE PROPOSED WATER SUPPLY PROJECT

2.1 Project Location

The project site is located within the Puyallup-White River Watershed, Water Resource Inventory Area (WRIA) 10. The project area, structures, and topography are shown on Figure 1 (modified from Figure 1-1 of Technical Memorandum [TM] 1 [HDR 2002]).

2.2 White River Hydroelectric Project

PSE owns the facilities associated with the White River Hydroelectric Project, located on the south side of the White River in Pierce County. From 1911 to January 15, 2004 the White River Hydroelectric Project generated power by diverting water from the White River, storing it in Lake Tapps, then releasing it back to the White River further downstream.

2.2.1 Water Rights

PSE's water right for the hydropower project is based upon claims of pre-code water dating back to 1895. Under the claims, PSE diverted up to 2,000 cfs from the White River for hydropower production. According to RCW 90.14.140(2)(a), water rights for power development are exempt from relinquishment if annual license fees are paid.

A 1986 settlement agreement between the Muckleshoot Indian Tribe and PSE requires that PSE maintain a minimum flow of 130 cfs in the White River at the Muckleshoot reservation boundary and a 3,650 second-foot-day (sfd) water budget for fish transportation.

Since ceasing hydropower generation, PSE has applied to add additional purposes of use to their water right claim (Claim #60822) to allow diversions for continuing recreation, reservoir maintenance, and water quality in the lake. The change application, which was submitted to Ecology on November 22, 2005, allows water to continue to be diverted from the White River for the purpose of maintaining water quality and recreation in Lake Tapps, and providing flows for the fish bypass structure and for fish or wildlife flow enhancement.

2.2.2 Hydroelectric Project Facilities

When in operation, the White River Hydroelectric Project diverted water from the White River at RM 24.3 near the town of Buckley. Diverted water traveled through an 8-mile-long diversion flowline consisting of flumes, canals, fish screens, five settling basins, and sections of pipeline.

Diverted water was stored in Lake Tapps Reservoir; a man-made reservoir consisting of a series of dikes that impound water in natural topographic depressions that once held four small lakes.

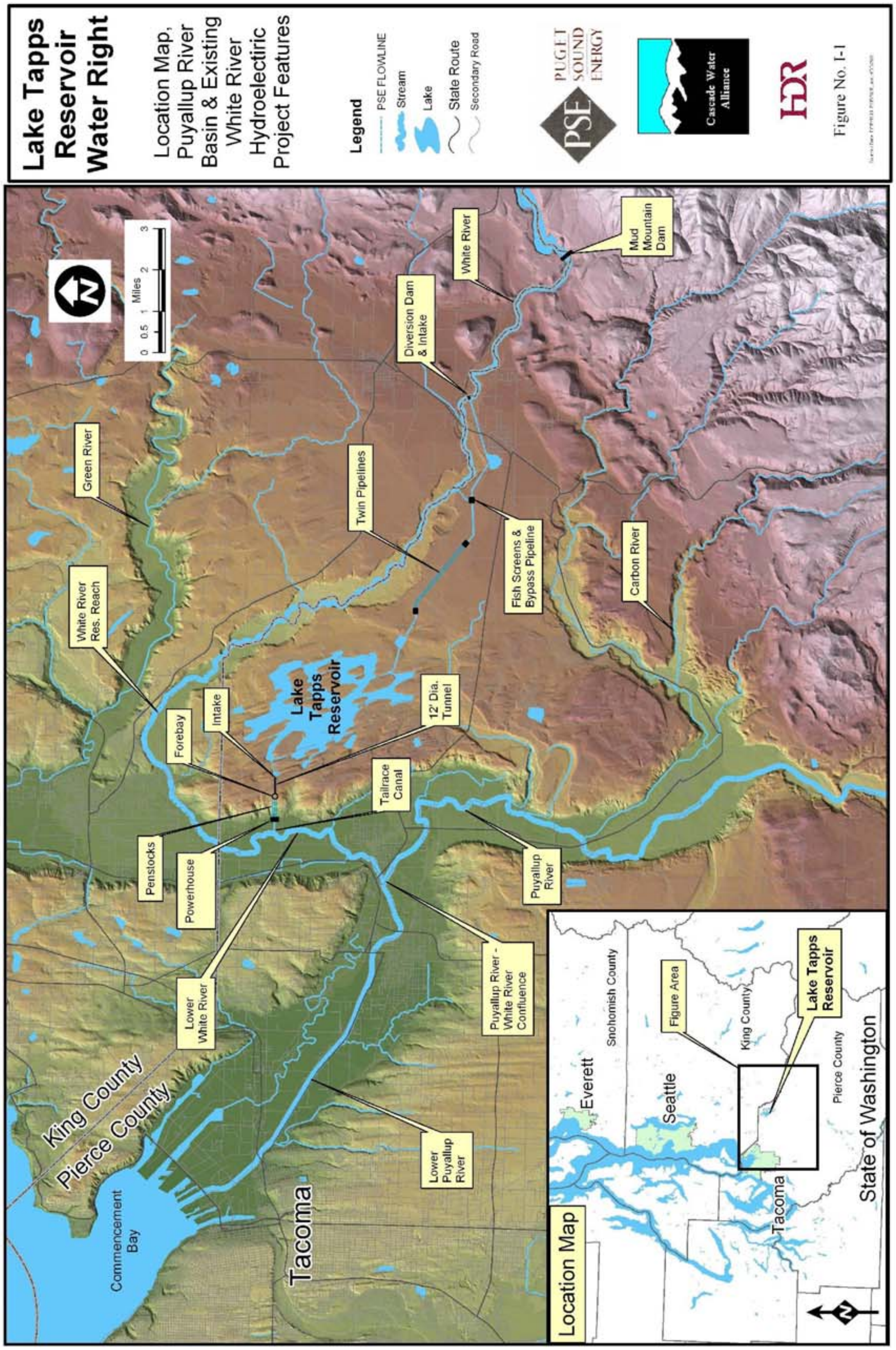

Figure 1 - Lake Tapps Project Area (modified from Figure 1-1 of TM 1 [HDR 2002])

Lake Tapps has a surface area of 2,700 acres and active storage capacity of 46,700 acre-feet. Water surface elevations can range from a normal maximum of 543 feet mean sea level (ft msl) to a minimum of 515 ft msl, which corresponds with the bottom of the outlet works.

The main outlet from Lake Tapps is a 12-foot-diameter concrete tunnel leading to the forebay, penstocks, and ultimately the powerhouse and turbines of the White River Hydroelectric Project. Released water flows through a 0.5-mile-long tailrace canal and back into the White River. Water diverted into Lake Tapps and released from the tailrace bypasses the reach of the White River between the diversion dam at RM 24.3 and the tailrace at RM 3.6 (Reservation Reach).

Downstream of the confluence of the tailrace and White River, the White River continues for 3.6 miles before joining the Puyallup River. The reach of the White River below the tailrace is referred to in this ROE as the Lower White River. From the confluence with the White River, the Puyallup River continues for 10.4 miles before entering Commencement Bay in Tacoma.

2.2.3 Operating Rules

2.2.3.1 Reservoir Operation

Historically, the lake has not been managed on a strict schedule of lake levels and releases, but rather as necessary to meet essential goals of power production demand, recreational lake levels, maintenance, and control the growth of aquatic plants. This has generally resulted in an annual pattern of pool elevations that roughly consists of four seasons:

- **Winter low pool -** A period of at least several weeks in winter when the lake is drawn down to elevations below 540 feet. Typically, the lake will be drawn down to an elevation around 537 feet msl for several months, followed by about a month at elevation below 530 feet. The lake is drawn down in winter to prevent the growth of aquatic plants, and to allow for maintenance of the levees.
- **Spring refill -** less water is released from the lake than is diverted from the White River during this period in order to raise the lake to summer recreational levels. Spring refill typically lasts about 45 days starting in mid-April and requires storing water at an average rate of around 340 cfs. On individual days the rate of storage may vary between 200 to 600 cfs.
- **Summer recreation -** the lake is maintained at recreational levels between 541.5 and 543 feet for the summer recreation season, which has historically been from Memorial Day to Labor Day.
- **Fall drawdown -** more water is released from the lake than is diverted from the White River in order to draw the lake down to winter low pool. Fall drawdown typically begins towards the end of September and has a variable length, but usually requires releasing approximately 100 to 300 cfs more than is being diverted into the lake.

2.2.3.2 Minimum Instream Flows

For the purposes of modeling the impacts of the project on the White and Puyallup Basins we have considered the Agency 10(j) minimum instream flows measured in the White River above Boise Creek at Buckley (U.S. Geological Survey [USGS] # 12099200) as the current minimum instream flows applicable to the White River. These flows are referred as Agency 10(j) flows because Ecology, in conjunction with the Washington State Department of Fish and Wildlife, the Muckleshoot Indian Tribe, the Puyallup Tribe of Indians, and the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service, developed the flows as a recommendation to the Federal Energy Regulatory Commission (FERC) under section 10(j) of the Federal Power Act. The Agency 10(j) minimum flows vary by season with lower flows required in winter and spring, and higher flows in fall. PSE has agreed to manage diversions into

Lake Tapps in a manner consistent with maintaining these minimum flows as a condition of the change to its claim on the White River that is being processed contemporaneously with this Report of Exam

2.2.3.3 Ramping Rates

Ramping rates are limits on the rate that the water level in a river can change as a result of a project action. The ramping rates in Table 1 currently apply to decreases (down-ramping) in flow resulting from diversion from the White River and releases from the tailrace. At the diversion dam, down-ramping rates apply only when flows are 2,000 cfs or less.

Table 1 - Ramping Rates for the Reservation Reach of the White River

Season	Daylight Rates[1]	Night Rates
February 16 to June 15	No Ramping Allowed	2 inches/hour
June 16 to October 31	1 inch/hour	1 inch/hour
November 1 to February 15	2 inches/hour	2 inches/hour

1) Daylight is defined as 1 hour before sunrise to 1 hour after sunset.

In addition to the hourly down-ramping rates, the flow in the Reservation Reach may not be decreased by more than 50 percent in a 24-hour period.

2.3 Proposed Water Supply Project

2.3.1 Water Rights and Place of Use

PSE has submitted the following three interrelated water right applications to the Ecology for the purposes of developing a water supply project (hereafter WSP) to provide municipal water supply.

1. S2-29920 (filed on June 20, 2000) seeks a surface water permit to divert up to 2000 cfs, not to exceed a withdrawal of 72,400 acre feet per year (af/y), from the White River for the WSP. The application commits that the total combined diversion of water under the hydropower claim and this new application would not exceed the 2000 cfs maximum diversion under the hydropower claim.
2. R2-29935 (filed on September 15, 2000) seeks a reservoir permit to store in Lake Tapps up to 2,000 cfs of water, not to exceed a withdrawal of 72,400 af/y that would be diverted from the river for the WSP pursuant to application S2-29920; and,
3. S2-29934 (filed on September 15, 2000) seeks a secondary permit to divert water from Lake Tapps for consumptive use as a municipal, commercial, and industrial water supply. The application requests a maximum instantaneous rate of 150 cfs, with an average annual rate of 100 cfs, and a maximum annual quantity of 72,400 af/y. Water would be diverted from the forebay of the hydropower project and then be treated and transmitted into a regional distribution system.

Under the change decision to PSE's existing claim made contemporaneously with this decision, the maximum diversion is 500 cfs during the refill period and 375 cfs at other times (subject to other limitations) for all authorized purposes except the hydropower purpose.

These water rights would be used to provide a regional municipal water supply within a specified Place of Use (POU). The POU establishes the geographical area in which area purveyors may incorporate water from Lake Tapps as a part of their supply source, for source exchange, as an operational supply (supplemental to other supplies) to accommodate conjunctive use of surface water and groundwater supplies, or to support system reliability during emergency and/or drought events.

The POU is shown on Figure 2, (TM 8 HDR 2002), which references township, range, and section boundaries for legal description purposes. The POU includes all King County urban growth areas (UGAs) and Utility Service Areas identified in the Central Puget Sound Regional Water Supply Outlook (Outlook) (CPSWSF, 2001), the Pierce County UGAs and Utility Service Areas in the Outlook (CPSWSF, 2001) except the Cities of Dupont, Eatonville, Roy, the Fort Lewis and McChord military bases, and the McKenna, Southwood, Graham Hill, Eldorado, and Chinook water systems. The POU also includes the Gig Harbor peninsula and the portion of the Olympic View Water District in Snohomish County that is partially supplied by the Seattle Public Utilities (SPU).

2.3.2 Water Supply Project Facilities

The WSP would use many of the existing structures from PSE's White River Hydroelectric Project. Water for the WSP would be diverted from the White River using the existing diversion dam, would travel down the existing flowline, and would be stored in Lake Tapps Reservoir. The WSP would withdraw water from the forebay of the hydropower facility and treat it to meet drinking water standards before conveying it to a regional water distribution system. A simplified schematic of the relationship between the WSP, Lake Tapps, and the White and Puyallup Rivers is shown on Figure 3 (modified from Figure 1-2 of TM 1 [HDR 2002]).

The following new facilities would be constructed as part of the project: raw water intake pipe, water treatment plant, and a transmission pipeline with booster pumps as needed. No changes are proposed to the diversion dam, diversion canal, or Lake Tapps Reservoir as a direct result of the WSP. Replacement of the diversion dam is planned as a component of another project. TMs 2 and 5 describe the project features and treatment system in greater detail (HDR 2002).

A Water Treatment Plant Feasibility Study (TM 5) was conducted as part of the Lake Tapps Reservoir Water Right Feasibility Report. The Treatment Plant Feasibility Study concluded that there was a suitable site for construction of a treatment plant and that the site had no known environmental or permitting issues that would preclude its construction. The feasibility study included the preliminary selection of a treatment process that would meet Washington State Department of Health (WDOH) standards. The selected treatment process includes an inlet control structure, screens, flocculation tanks, membrane filtration, granular activated carbon beds, wash water recovery, and solids recovery. Because the initial phase of the water supply development is not scheduled to be needed until 2024, modification of the selected treatment process is anticipated in response to future technological advances. The final treatment configuration will be subject to review and approval by WDOH.

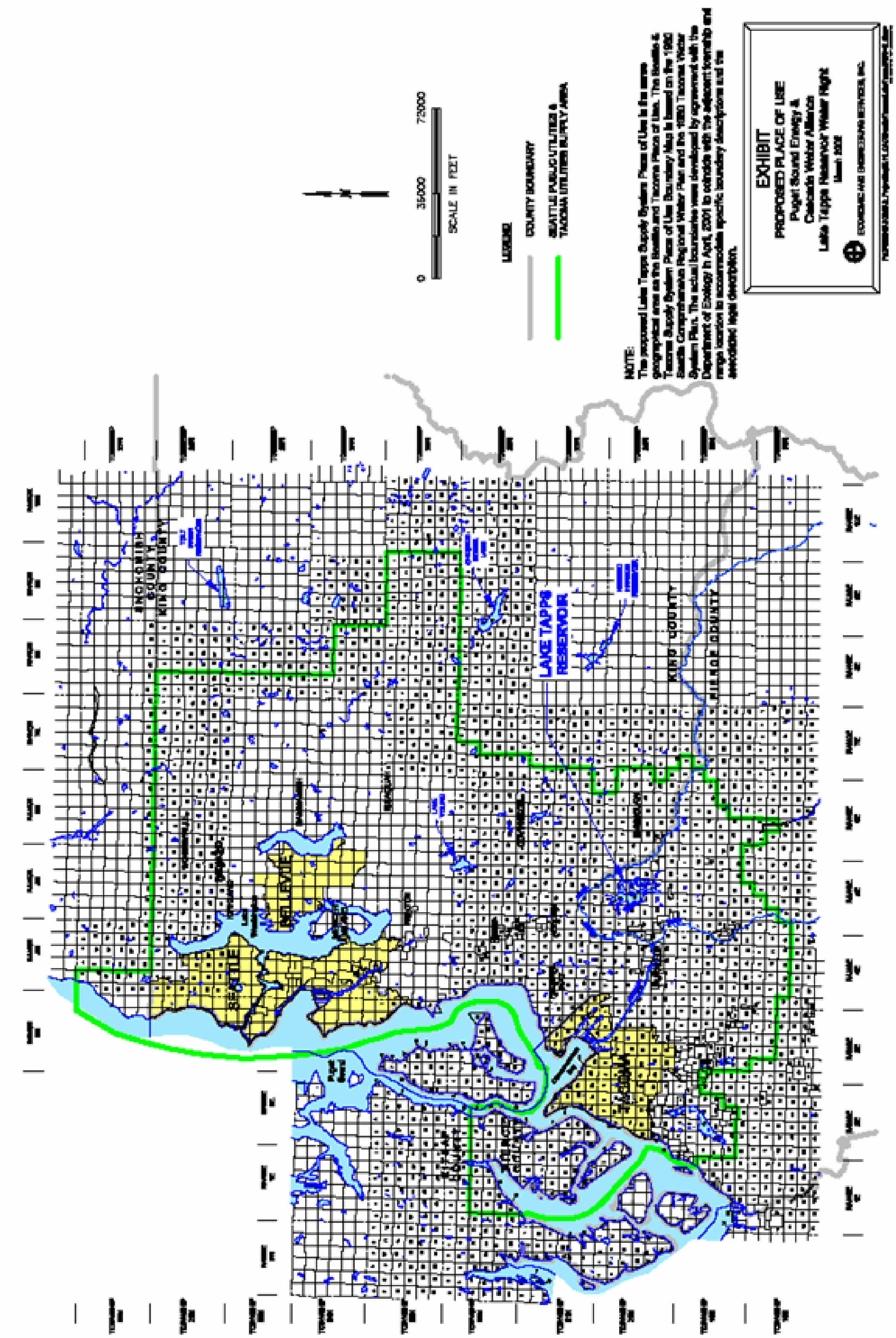

Figure 2 - Proposed Place of Use Exhibit (from TM 8 [HDR 2002])

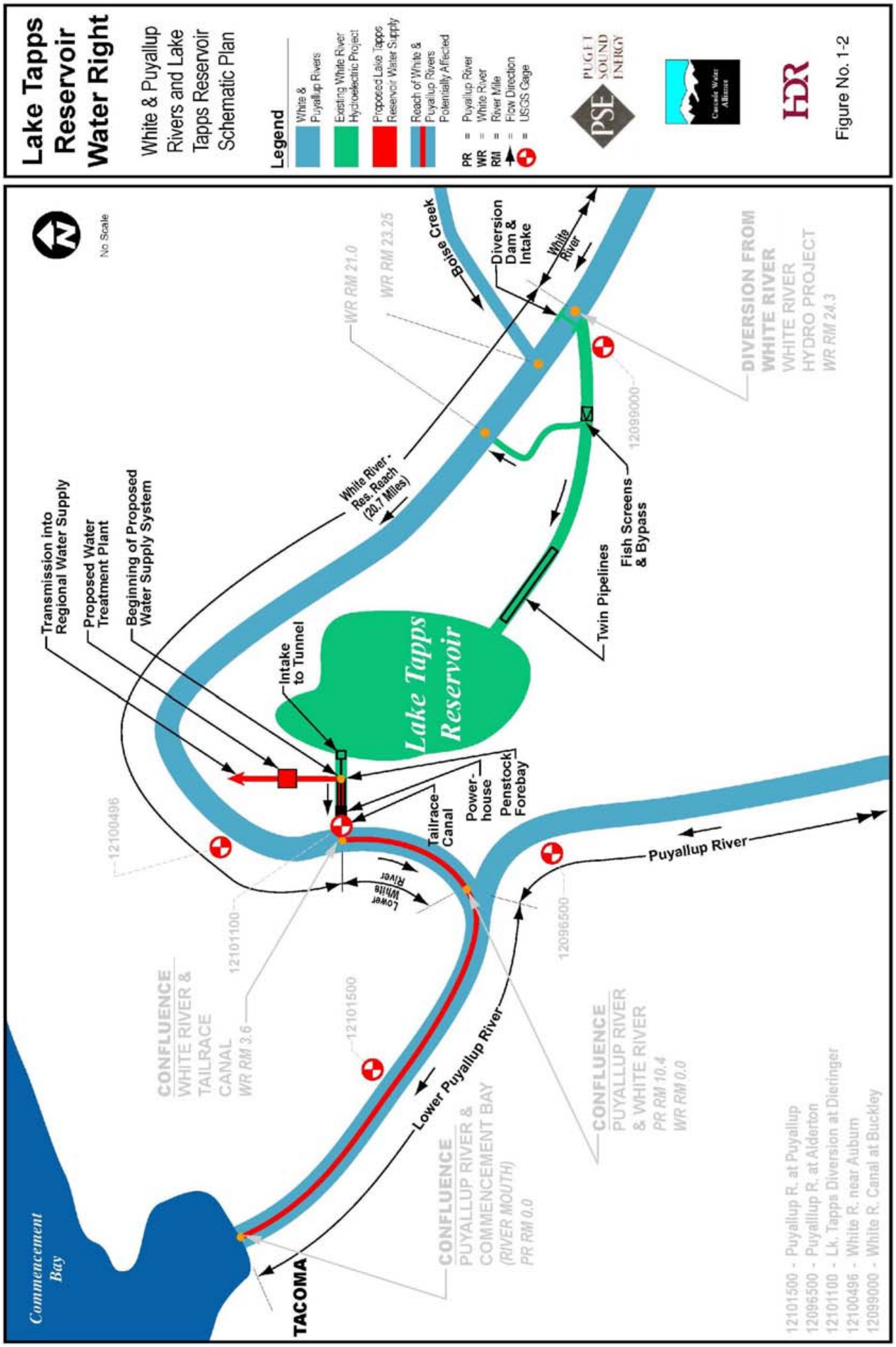

Figure 3 - White & Puyallup Rivers and Lake Tapps Reservoir Schematic Plan (modified from TM 1 Figure 1-2 [HDR 2002])

2.3.3 Operating Rules

2.3.3.1 Proposed Reservoir Operations

PSE has indicated that with the WSP reservoir operations would follow a similar seasonal pattern to historical conditions, but with several changes. The green band shown in Figure 4 is the proposed target lake elevation with the WSP. The goal of operations would be to maintain the lake within the green band to the extent that hydrologic conditions and other operating priorities (such as environmental mitigation) allow.

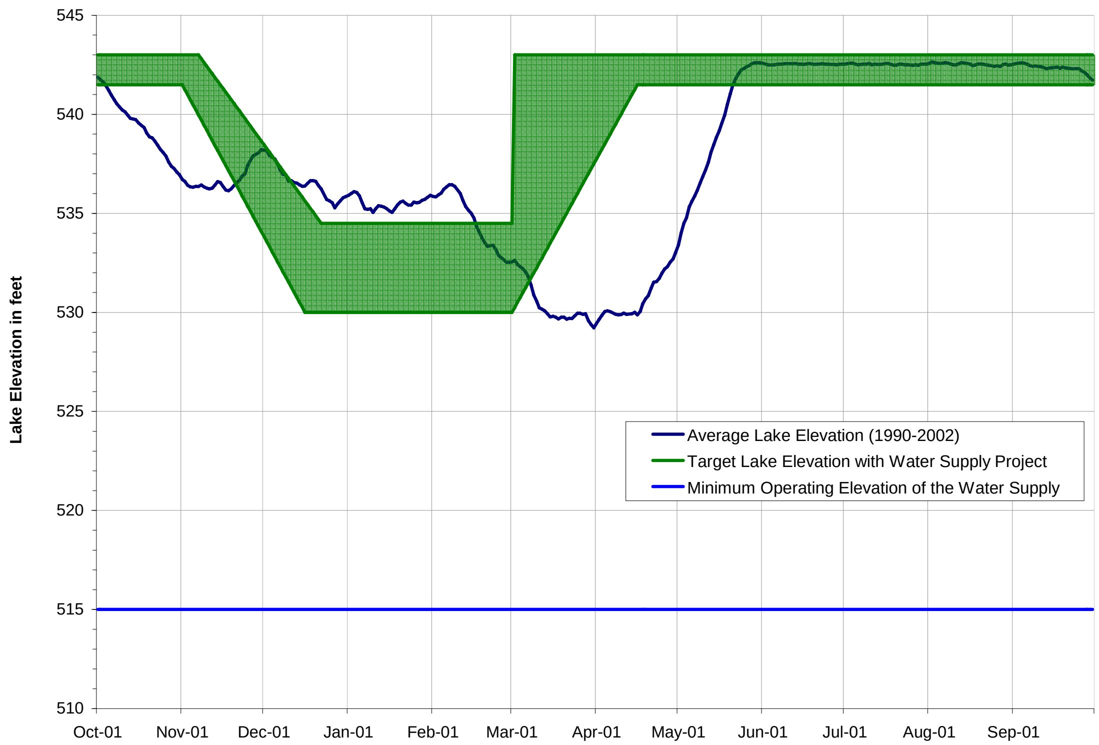

Figure 4 - Comparison of Historical Lake Elevations with Target Lake Elevations for the Water Supply Project.

The target operating range differs from the adopted pattern for historical operations primarily because of the specified recreational period. An agreement between PSE and the Lake Tapps Community (dated March 31, 2004), established that the goal is to maintain the lake at an elevation between 541.5 and 543 feet from April 15 through October 31. While PSE had no requirement in its existing right to follow a specific time period for maintaining certain reservoir levels, the agreement with the Lake Tapps community insures the recreational period both earlier in spring and later in fall. However, it does not guarantee that recreational levels would be met, because according to the prioritization system proposed by PSE use of water for recreation is a lower priority than use for the WSP or for instream mitigation flows. The proposed priorities for releases/use of water in Lake Tapps are defined in Section 2.3.5.

2.3.3.2 Minimum Instream Flows

As noted in section 2.2.3.2, PSE has agreed pursuant to the change of its claim, to operate the diversion into Lake Tapps in accordance with Agency 10(j) flows. Under the terms of this ROE, diversion of water for the WSP ,from the White River would be subject to the "Modified 10(j)" minimum flows measured at the diversion dam (Table 2).[1]

Table 2 - Minimum Instream Flows

Month	Agency 10(j) Minimum Flow	Modified 10(j) Minimum Flow
January	306	350
February	299	350
March	308	350
April	314/364	400
May	373	400
June	333	400
July	339	500
August	342	500
September	342	500
October	490	500
November	385/310	385/350
December	304	350

These flows are a condition of approving the WSP as an enhancement over the baseline Agency 10(j) flows and are more beneficial for instream flows in the White River. Increases to the minimum instream flow requirement above the Agency 10(j) flows are allowable under the additional authority to impose such restrictions when issuing a "new" water right.

Figure 5 shows the variation in the Agency 10(j) and Modified 10(j) flows throughout the year. The Modified 10(j) flows adjust the final Agency 10(j) flow requirements in principally three ways: (1) The original 10(j) flows allowed for consideration of the flow contributions from Boise Creek, whereas the modified 10(j) flows do not, for the reason that Boise Creek flows are rainfall dependant and unreliable; (2) they establish a 500 cfs flow for temperature mitigation from July through October;[2] and (3) they simplify flow requirements in April, establishing a single minimum flow requirement for that month.

2.3.3.3 Ramping Rates

The WSP proposes the same ramping rates as those under the existing hydropower claim. Compliance with down-ramping rates will be measured by the applicant at staff gages located immediately downstream of the diversion dam and the tailrace.

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[1] These flows are also recommended by NOAA Fisheries as interim operating flows.

[2] In its biological opinion, NOAA Fisheries (2003) recommended as a compromise a more complicated temperature requirement that would require monitoring of the river and implementation of the modified 10(j) flows whenever temperatures were above 16°C. After reviewing recent temperature data for the White River, Ecology determined that the higher flow requirement is necessary to maintain White and Puyallup River temperatures at levels near standards; and that NOAA's compromise proposal would be cumbersome to implement and result in (potentially) undesirable weekly variations in flow in the river during summer months to be able to match flow to temperature.

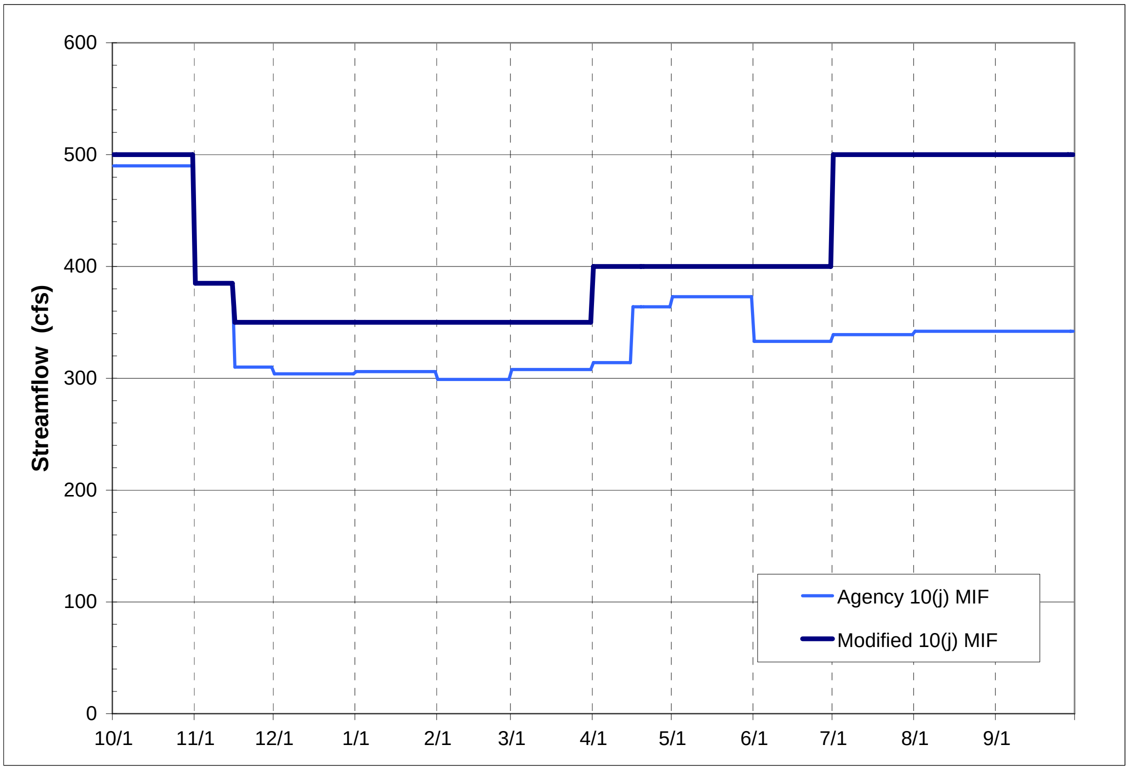

Figure 5 - Minimum Flows for the White River Reservation Reach

2.3.4 Additional Mitigation Measures

In addition to complying with the Modified 10(j) instream flows, the applicant has included a mitigation program to reduce or offset any potential environmental impacts of the WSP relative to the existing conditions. The mitigation program includes five components:

2.3.4.1 Minimum Instream Flow Compliant Diversion (MIF Compliant Diversion)

Under this mitigation component, the applicant will not divert water from the White River for **any** purpose of use under the existing claim or the new water right when flows are predicted to be below the minimum instream flow at the Puyallup River at Puyallup gage (USGS #12101500) as established in WAC 173-510-030. Diversions would be reduced by an amount equal to the difference between the predicted flow and the minimum instream flow (MIF). To implement this mitigation element, the applicant would have to establish a method of predicting when flows at the Puyallup River gage will be below the MIF with enough lead time to be able to curtail diversions early enough to allow the additional water to travel to the Puyallup River gage in time to avoid (or lessen) the MIF excursion.

2.3.4.2 Fall Drawdown Plan

During evaluation of the water right application, Ecology determined that the WSP had the potential to increase the number of MIF violations occurring in the Puyallup River during October, and the fall drawdown period. The WSP had the potential to increase the number of MIF violations by changing the timing of releases during the fall relative to the adopted historical pattern. The mitigation plan will include the following element to address this situation:

- When the Puyallup River flow is projected to be below the MIF in October, the project will release, to the extent that water is available in the reservoir, from Lake Tapps up to 50 cfs or the amount necessary to meet the MIF, whichever is less.

- When the Puyallup River flow is projected to be below the MIF during the fall drawdown period, the release from Lake Tapps, to the extent that water is available in the reservoir, will be no less than 300 cfs or the amount necessary to meet the MIF, whichever is less. The fall drawdown period is defined as November 1 until the reservoir reaches winter low pool.

The Fall Drawdown Plan does not authorize or require any addition diversion of water from the White River but rather relates only to the timing of releases to be made during the fall drawdown period. Fall releases are in addition to reductions in the amount of diversion under the MIF Compliant Diversion.

2.2.4.3 Land Conservation

PSE has offered to conserve land owned by PSE in the White River watershed as an element of the water supply project application process. In this regard PSE has committed to transfer 2500 acres of mostly riparian land in the White River Basin to a land conservancy group whose mission is to preserve natural and open space lands and maintain public access. PSE is currently working with the Cascade Land Conservancy (CLC). CLC is a private, non-profit organization that preserves natural and open space lands in urban and rural communities, along rivers and streams, and in the foothills of the Cascades. CLC works collaboratively with individual landowners, organizations, and local governments to protect and steward our community's treasured landscapes. CLC's strategies range from land purchases and donations to conservation easements and ownership agreements. It is common for the CLC to transfer land to other parties with conservation covenants and easements that follow the transfer of the land and that continue to protect the resources. CLC's goal is to maximize the ecological value of land while meeting the needs of landowners. The land will be transferred by January 1, 2008.

2.2.4.4 Source Exchange

The applicant has agreed to provide up to 16 million gallons per day (MGD) peak supply (QI) up to a total annual volume (QA) of 11,000 acre-feet solely for a Source Exchange Program. Source exchange water would be used to replace supplies for public water systems whose normal supply adversely impacts the Priority Surface Waters. The objective of the Source Exchange Program would be to maximize the overall biological benefit to endangered or impaired fisheries within the authorized place of use. Source exchange water would not be available to serve growth or to increase a utilities normal water supply.

2.3.5 Operating Rule Priorities

The operating rule priorities establish the hierarchy for determining the quantity of water to divert from the White River and how to use the water stored in Lake Tapps. The diversion and release priorities are particularly important in periods where not enough water is available to meet all needs.

The following prioritization would be used to determine when to divert water and how much water to divert from the White River:

1. Comply with Modified Agency 10(j) flows in the White River;
2. Operate the fish screens in the diversion canal;
3. Comply with the Puyallup River MIF by implementing the MIF compliant diversion mitigation element (see Section 2.3.4.1); and,
4. Divert into Lake Tapps only the amount of water necessary for water supply, recreation, and maintenance of water quality in the lake.

The following prioritization would govern how water being stored in Lake Tapps will be used;

1. WSP withdrawals;

2. Releases to maintain water quality; and,
3. Releases and/or storage of water to achieve desired lake levels for recreation, maintenance, prevention of plant growth, etc.
4. Fall flow releases (see Section 2.3.4.2);

In addition, the applicant would conduct a multi-year study to determine the amount of inflow to the lake necessary to maintain water quality. This study would be a key component for determining future operations of the reservoir. The prioritization governing storage of water in Lake Tapps does not otherwise limit PSE's maintenance of reservoir levels.

3.0 INVESTIGATIONS

3.1 Overview

This application has been processed through Ecology Cost-Reimbursement Project No. 9E52, under agreement between Ecology and PSE. PSE initiated participation in a cost recovery agreement with Ecology through a letter dated October 4, 2000, from Tom McDonald of Perkins Coie LLP. Pending water right applications in the Puyallup-White River Watershed (WRIA 10) senior to and including PSE's applications were evaluated and processed as part of this project.

Evaluation of this application included, but was not limited to, research, review, and consultations relating to: the three water right applications and associated files; the protestants' concerns; pertinent state water codes; existing water rights in the vicinity; meetings with the PSE's technical team, including legal counsel, hydrologists, fishery biologists, and water quality scientists; comments from other resource agencies, including the Washington Department of Fish and Wildlife (WDFW) and the WDOH; technical memoranda submitted in response to a Preliminary Permit associated with this application; the State Environmental Policy Act (SEPA) Environmental Checklist (CWA 2003); site visits on October 3, 2001 and December 5, 2001; FERC and NOAA Fisheries documents related to the White River Hydroelectric Project and discussions/meetings with agency water quality/watershed assessment staff.

In response to the requirements of a Preliminary Permit issued by Ecology to PSE on March 20, 2001, the applicant submitted a series of Technical Memoranda (TM) related to various aspects of the WSP project. In this document, the final versions of these TMs are referred to by TM number (e.g., TM 16). The TMs can be found in: HDR 2002. Lake Tapps Water Right Feasibility, Technical Memoranda Volumes I and II.

An initial ROE approving the three water right applications was issued June 30, 2003. Hart Crowser, Inc., had primary responsibility for the investigation with significant support from Ecology staff and from sub-consultants Gray and Osborne, Inc. and Aspect Consulting, LLC. On July 1, 2004, the Pollution Control Hearings Board remanded the ROE to Ecology for reevaluation in light of the applicant's decision to cease generating hydropower. Ecology staff, WDFW staff, and Aspect Consulting, with input from Geomatrix, Inc., participated in the reevaluation and preparation of this draft ROE.

Following cessation of hydropower, PSE applied for a water right change to add recreation and maintenance of water quality as purposes of use for their existing water right claim. The investigations conducted in preparation of this ROE focus on changes to the White and Puyallup River watersheds caused by implementation of the WSP only and not the use of water under the hydropower claim or the application for change of use to the claim. The uses under the water right claim, including those uses applied for in the change, form the Baseline for comparison with the WSP.

3.2 Procedural Elements of the Investigation

3.2.1 Notice

The applicant published Public Notices for this project in the Tacoma News Tribune on October 5 and 12, 2000.

3.2.2 Protests and Comments

Four formal protests were submitted to Ecology regarding the water right applications associated with the WSP. The protestants' concerns are briefly summarized below.

3.2.2.1 Auburn Protest

A protest was submitted from the City of Auburn on November 2, 2000, focusing on concerns regarding the accelerated timing of the review of senior applications under the Cost-Reimbursement Program, specifically regarding the City of Auburn's pending water rights applications for Wells 6 and 7. Auburn was concerned about not having sufficient time to complete studies to support their water right applications. These applications were formally withdrawn by Auburn on August 6, 2002.

3.2.2.2 Puyallup Tribe of Indians Protest

A protest was received from the Puyallup Tribe of Indians (PTI) on November 8, 2000, requesting that Ecology not proceed with permitting until it has cooperated with the tribal water resource managers in addressing environmental and regulatory issues. The PTI expressed concern about the following:

- Harm to fisheries caused by committing water to consumptive uses;
- Likely increases in thermal and contaminant loading in the Puyallup River system;
- Impairment of existing water rights, including tribal rights;
- Need for programmatic and site-specific environmental impact statements;
- Need for appropriate instream flows relative to fisheries requirements; and
- Concern that the applications are not clear about whether additional water would be diverted beyond PSE's existing water right claims.

The PTI submitted additional comments on February 15, 2002, and September 23, 2002, regarding Technical Memoranda prepared by HDR in response to the project's Preliminary Permit. Those comments primarily focused on the following additional areas:

- TMs disregard Tribal jurisdiction over water flows, levels, and water quality in portions of the Puyallup River;
- WSP would impact the Puyallup River TMDL and waste load allocation;
- Public water quality analysis does not meet WAC 246-290-130 requirements;
- Lack of demonstrated need for the water supply;
- Baseline for measuring impacts of the WSP should not include the existing hydropower facility;
- Enhancement water from Lake Tapps is of poor quality and the 11,100 ac ft budget is insufficient. Instead, enhancement water should be released from the diversion dam rather than the tailrace.
- Puyallup River MIFs should be evaluated instantaneously not on a daily average;
- Flow model over-predicts water quantities and thus is not reliable;
- Water quality impacts violate Tribal and State antidegradation policies; and
- Reductions in flow caused by the WSP would impact fish production and access to off-channel habitats.

3.2.2.3 Muckleshoot Indian Tribe Protest

Ecology received a protest from the Muckleshoot Indian Tribe (MIT) on November 9, 2000. The MIT protest was based on the adverse effects on flow regimes, water quality, and aquatic and riparian ecosystems function of the White and Puyallup Rivers caused by the withdrawal of water for consumptive use. The MIT protest identified two primary concerns:

- Lack of a demonstrated need for a regional water supply from the White River; and
- PSE's failure to demonstrate environmental benefits.

The MIT submitted lengthy additional comments on August 14, 2002, regarding the Technical Memoranda prepared by HDR in response to the project's Preliminary Permit. Those comments primarily focused on the following additional areas:

- WSP is purely a speculative economic interest;
- Lack of detail on the proposed distribution system;
- Lake Tapps water is not the "Highest Quality Source" available to meet future demands;
- Proposed source exchange mitigation is unproven and speculative at best;
- TMs use an inappropriate Baseline from which to measure impacts of the project;
- Flow model contains flaws that make it unreliable for assessing impacts; and affect the water quality analyses; and
- Out-of-basin transfer of municipal water supply by private entities raises substantial public policy issues.

3.2.2.4 Response to Tribal Comments

The technical and policy comments from the Tribes have been considered carefully during review of the water right applications. Many of the Tribes' technical comments are addressed in the Investigations section of this ROE, particularly in the discussions of the water quantity and quality analyses. Concerns over impairment of treaty water rights are addressed in the Impairment Discussion in Section 4.3.

In addition, several of the Tribes' major concerns have been addressed by subsequent changes to the applicant's proposal and/or results of additional analyses. For example, the applicant has ceased generating hydropower, has clarified that no additional water beyond that allowed by the existing claims would be diverted from the White River, has modeled the 7Q10 flows, and has modified the proposed flow mitigation to reduce diversions from the White River instead of increasing releases from the lake. Further, in response to an Ecology request for additional information, the applicant prepared a draft memorandum with additional technical analysis aimed at responding to several tribal comments (HDR 2003). The following points briefly describe Ecology's conclusions regarding several of the Tribes' major concerns:

<u>Suitability of Lake Tapps as a Drinking Water Source.</u> Ecology has sufficient information to conclude that it is feasible to treat Lake Tapps water to provide a high quality drinking water source. Department of Health would conduct additional reviews of the Water System Plan and other components of the proposed water supply before a water supply withdrawal from Lake Tapps would begin.

<u>Lack of Demonstrated Demand for a New Regional Water Supply.</u> The intent of the WSP is to provide a significant source of public water supply for meeting the future needs of Central Puget Sound. Due to its scale and central location, this project would provide a unique potential source to meet public water supply needs within the Central Puget Sound region and thereby increase the reliability of meeting future demands. As discussed in this ROE, the CWA predicts that without a significant new source of water such as the Lake Tapps supply, CWA members would have an

average unmet demand of 27.5 MGD by 2034, 54.9 MGD by 2054, and increasing to 61.1 MGD in 2055. If future regional water planning efforts determine that the demand for this water has been overestimated, the terms of this permit provide that in 2036 Ecology will reassess the level of need projected for 2054, and adjust the amount of the permit accordingly in a superseding permit.

Definition of Baseline from Which to Measure Impacts. The Baseline Condition used in the applicants' analyses and this ROE is fair because it represents the most likely future operations of Lake Tapps; is independent of the WSP; and is enforceable in that Ecology can condition the WSP to require that certain elements of the Baseline Condition would be met.

Water Quantity Model. No model perfectly represents the real world. The water quantity model is adequate for evaluating the proposed project and was revised to incorporate many of the protestant's comments. The water quantity section of this ROE addresses limitations of the model and some of the specific changes that were made to address comments.

Water Quality Impacts. The WSP would result in an improvement in water quality. The higher Modified 10(j) MIFs and the compliance with the Puyallup River MIF at the diversion dam would leave more water in the Reservation Reach of the White River during critical low flow periods. This additional water would help reduce temperature and pH problems in that reach, as well as provide water quality benefits further downstream. There are periods when the WSP would potentially impact water quality however, the impacts would be short-lived, of small magnitude, and are more than offset by the improvements in water quality during the most critical periods.

Adequacy of Proposed Mitigation. The mitigation proposal has changed significantly since the Tribes' comments. Enhancement water has been removed from the proposal and the source exchange component has been significantly refined to add specific commitments. In addition, the applicant has proposed to comply with Puyallup River MIFs by curtailing diversion instead of increasing releases from the lake.

3.2.2.5 CELP Protest

A protest was submitted from Center for Environmental Law and Policy (CELP) on November 10, 2000, citing concerns focused on potential "take" under the Endangered Species Act (ESA). The protest letter assumed that an additional 2000 cfs would be withdrawn from the White River under the applications. PSE has clarified that the total combined diversion from the White River for their existing claim and the new water supply would be limited to a maximum of 2000 cfs.

3.2.2.6 WDFW Comments

The Washington Department of Fish and Wildlife (WDFW) issued two comments letters to Ecology, dated November 8, 2000 and July 28, 2006. The November 2000 letter cited concerns focused on the impacts of the WSP on fish in the White and Puyallup Rivers and Lake Tapps. WFDW’s concerns have been considered carefully during review of the water right applications, and have been addressed by subsequent changes to the applicant's proposal and/or results of additional analyses. A summary and response for WFDW’s major concerns, are summarized below:

- The WSP intends to divert water into Lake Tapps for a use other than hydropower without filing a change application.

PSE filed a change application to Ecology on November 22, 2005, which would allows water to continue to be diverted in to Lake Tapps from the White River for the purpose of maintaining water quality and recreation in Lake Tapps, and providing flows for the fish bypass structure and for fish or wildlife flow enhancement.

- The minimum instream flows in the White River Reservation Reach are less than desired for fish, and it is unclear that the MIFs are instantaneous flows and are not based on daily or hourly averages.

  As noted in section 2.2.3.2, PSE has agreed pursuant to the change of its claim, to operate the diversion into Lake Tapps in accordance with Agency 10(j) flows. Under the terms of this ROE, diversion of water for the WSP ,from the White River would be subject to the "Modified 10(j)" minimum flows measured at the diversion dam (Table 2). These flows are equal to or greater than the flows desired by WFDW and are instantaneous limits, not hourly or daily averages.

- The WSP needs to include down ramping rates to protect fish in the White River, and it needs to be clear that the rates are instantaneous, not based on hourly or daily averages.

  As noted in section 2.2.3.3, down ramping rates equal to WDFW's recommendations are included as a part of the WSP operating rules. These limits are instantaneous rates, not hourly or daily averages.

- The water right must include stream gaging requirements in order to implement MIF and ramping requirements.

  Stream gaging requirements of the project are included as outlined in section 5.3.15.

- To protect fish the water right must include requirements for screening of diverted water. While there is currently screening in the diversion canal , there is presently no screening of the water withdrawn from Lake Tapps.

  Fish screening requirements of the project are outlined in section 5.3.13. The fish screening requirements apply to all diversion structures, including withdrawal from Lake Tapps.

WDFW's July 2006 letter indicates that the proposed revisions to the minimum instream flows and ramping rates are acceptable since they are equal to or greater than what was recommended. It re-iterates that these are both instantaneous rates and not based on hourly or daily averages. The letter also notes that an Hydraulic Project Approval from WDFW is required, in addition to Army Corps of Engineers permits for new construction and rebuilding of existing structures.

3.2.3 State Environmental Policy Act (SEPA)

In 2001, CWA assumed lead agency status for undertaking a SEPA analysis of the proposed WSP. A SEPA Environmental Checklist was prepared on behalf of PSE, and submitted in draft to CWA on October 10, 2003. The draft was finalized on February 10, 2003. CWA issued a finding of Mitigated Determination of Nonsignificance (MDNS) on February 13, 2003. There was a 30-day comment period ending March 17, 2003.

Ecology submitted comments to CWA in a letter dated March 17, 2003. Ecology's comments generally addressed inconsistencies between the Environmental Checklist and the TMs regarding the water quantity, lake level, water quality, and the supply and demand analyses. CWA published an addendum to the SEPA MDNS on May 13, 2003, consisting of updated demand forecasts and a response to comments.

3.3 Projected Demand and Available Supply

Under an MOU with PSE dated August 7, 2001, and amended December 20, 2002, CWA may purchase and develop the water rights into a regional water supply. Pursuant to the MOU, a preliminary agreement was signed on April 27, 2005 to transfer ownership of Lake Tapps and associated water rights from PSE to the CWA.

The intent of this WSP is to provide a significant source of public water supply for meeting the future needs of customers and businesses in the Central Puget Sound region. Providing reliable public water supplies that meet the needs of population and economic growth is an important state policy recognized in RCW 90.54.010 & 020. As discussed below, the supply and demand analysis predicts that without a significant new source of water such as the Lake Tapps supply, CWA members would have an average unmet demand of 22.42 MGD (25,123 af/y) by 2034 and of 54.41 MGD (60,970 af/y) by 2054, the year when CWA's supply contract with SPU expires.

A water right for an average annual amount of 64.6 MGD (72,400 af/y) is reasonable in light of this supply and demand analysis, and consistent with the development schedule and stated intent of providing a source of water for source exchange; this permit will allocate the following annual volumes of water:

- 61,400 af/y for 2054 demand
- 11,000 af/y for source exchange
- 72,400 af/y (total)

The WSP is proposed to be developed based on 50-year demand and supply projections for CWA members within the CWA Regional Water System. The development of the public water supply will be based on projections for two phases: the first 30 years, to 2034, and the remaining 20 years, to 2054. Given that securing adequate water for meeting future population and economic growth is becoming difficult, the planning horizon for locating and permitting new regional public water supply sources and needed infrastructure has considerably lengthened.

3.3.1 Supply and Demand Analysis

The intent of the WSP applications is to secure water rights to supply the municipal water needs of the Central Puget Sound region. A report prepared for the applicant by EES, titled *Lake Tapps Beneficial Use Analysis and Development Schedule (*May 2002), describes the project as follows:

> *CWA's plan is to develop the supply potential of Lake Tapps (66 MGD average/100MGD max day) and then to incrementally manage the supply for meeting new demands from CWA members and as an Environmental Supply (Source Exchange, Flow Enhancement, and Flow Management) for all municipal and tributary supply needs that are accessible to the existing and expanding regional piping system in the defined Place of Use.*

The demand projections are based on the Cascade Composite Forecast presented in CWA's 2004 Transmission and Supply Plan (TSP), dated March 24, 2005. The demand projections are shown in Table 3. The water supplies noted in Table 3 are the existing supplies of CWA members and were taken from information provided in the TSP and verified by comparison with Table 6-1of

Outlook (CPSWSF, 2001). The base year demand (2005) was established using recent data on actual consumption and growth. The demand forecast was developed by starting with the base year and then applying the growth rates in demand as forecasted by each CWA member. Where members' individual forecasts did not extend to 2050, demands were extrapolated to 2050 using a growth rate of 1.0 percent per year.

CWA and its members' conservation programs are reflected in the CWA demand projections. According to the TSP, prior to 2003, five of the eight CWA members received certain regional conservation services and programs through the Saving Water Partnership – Seattle Public Utilities' 1% Conservation Program. CWA has advised that the remaining three jurisdictions (Covington, Issaquah and Sammamish Plateau) had conservation programs equivalent to the regional program generally reflected in the SPU 1% program. In 2004, the CWA Board approved a Transition Water Conservation Program that allowed CWA members to work together to develop regional conservation strategies for the collective CWA service area. The TSP provides a framework for CWA's long-term water conservation program. The TSP indicates CWA will continue to pursue cost-effective conservation measures that reduce average daily demand and peak season demand.

PSE has requested an annual withdrawal of 72,400 af/y (64.6 MGD). By the year 2034, CWA anticipates a demand from Lake Tapps of approximately 22.42 MGD average daily demand, which equates to approximately 25,123 af/y. By the year 2054, CWA anticipates demand from Lake Tapps of 54.41 MGD average daily demand, for a total of 60,970 af/y.

3.3.2 Alternative Supply Analysis

Lake Tapps is one of the potential regional supply options available to serve the future growth in demand in the central Puget Sound area. A discussion of the conventional supply options (options that increase the amount of water available to meet demand) and other options such as conservation, reuse, and stormwater is included in the Outlook (CPSWSF, 2001). The conventional supply options discussed include new ground and surface water sources, expansion of existing ground and surface water sources, storage which makes more water available when it is needed, and interties which allow conjunctive use of supplies.

The Outlook (CPSWSF, 2001) profiled the conventional supply options identified by the Central Puget Sound Water Suppliers Forum. The profile included a project description that identified the lead agency for the supply project and the associated capacity, purpose, and potential service and supply area. The options were characterized by yields, costs, institutional constraints, and environmental considerations. Finally, the projects were classified according to status of planning and permitting as a measure of how viable a project may be. The Outlook (CPSWSF, 2001) was careful to point out that the "status" was not intended to indicate the order in which projects will or should be implemented. In other words, the Outlook (CPSWSF, 2001) did not take a position on or compare the merits of any of the alternatives.

In the absence of a regional evaluation comparing the merits of various supply options, the Lake Tapps supply option was evaluated on its own merit. From the perspective of providing a supply to meet the future demand of the CWA members, we note that the Lake Tapps project is the only supply option in which PSE or CWA is listed as the lead agency. Demonstration of "need" is therefore based on evaluation of CWA's projected demand versus its existing supplies and other contracted supplies.

According to the draft TSP, CWA plans to utilize a combination of local and regional water sources to provide water to meet its members' needs for water supply through 2023. These sources include:

- Ground water sources owned by individual CWA Members;
- Water purchased on a wholesale basis from Seattle Public Utilities, under the 50-year declining block contract which became effective January 1, 2004;
- Water to be purchased under a pending contract with Tacoma Public Utilities (TPU) from Tacoma's Second Supply Project (TSSP). This includes an interim component through 2025 and a permanent component;
- Water purchased separately from TPU by Covington under its share as one of the four TSSP partners;
- Reclaimed water from King County Metro and/or other sources; and,
- Additional supplies as needed during the initial 20-year period of the TSP (these additional supplies do not include Lake Tapps).

These sources are listed in Table 3, with quantities of water available on an average day basis.

Table 3 - Mix of Supply Resources

Source	Supply Available in MGD (Average Day Basis)		
	2004	2034	2054
Member-owned groundwater[1]	14.60	15.50	15.50
Covington contract with TPU	---	5.28	5.28
Other local contracts	0.15	---	---
SPU Block Contract	30.30	20.30	---
TPU Contract (Interim)	---	---	---
TPU Contract (Permanent)	---	4.00	4.00
Reclaimed Water	0.01	0.89	0.89
Total Supplies	**45.06**	**45.97**	**25.67**

[1] Groundwater production on average day basis assumed to be 75% of Members' water rights.

Source: CWA 2005 Table 7.1. Data were extrapolated from 2050 to 2054.

Table 4 compares the forecasted demands with available supplies. A deficit of 22.42 MGD is shown in year 2034 and a deficit of 54.41 is shown in year 2054. This is due to both population growth and the declining supplies available under contract from SPU and TPU. The data is presented in terms of average day demand. The draft TSP also indicates proportional deficits in terms of maximum day and maximum week supplies and demands.

Table 4 - Comparison of Supply and Demand in MGD

Year	Demand	Supply	Deficit
2004	41.55	45.04	N/A
2034	68.39	45.97	22.42
2054	80.08	25.67	54.41

CWA has indicated in its draft TSP that Lake Tapps would be developed as a source of supply to meet the deficit beginning in 2023, as the SPU and TPU supplies are reduced and as growth continues.

3.3.3 Source Exchange

An integral part of the PSE proposal and a significant component of this Supply and Demand Analysis is the Source Exchange Program, in which utilities within the POU use this supply rather than other existing sources that cause impacts to streams in other areas. Source exchange may allow a utility to reduce its surface water diversions or groundwater withdrawals during times when instream flow objectives are not being met or unusual times when existing supplies are not adequate to meet demand.

As a component of this permit authorization additional analysis would be conducted to determine which streams and water purveyors would participate in the source exchange program. The permit holder would develop a program to provide up to 16 MGD peak supply and a total annual volume of 11,000 acre-feet solely for source exchange. A more detailed description of the source exchange program is included in Section 5.3.17.

Table 5 - CWA Total Water Demand in MGD

Year	Issaq.	Samm. Plateau WSD	Bellevue	Kirkland	Redmond	Cov. WD	Tukwila	Skyway WSD	Total
2004	1.88	5.10	15.67	4.06	7.76	4.07	2.30	0.71	41.55
2005	2.16	5.37	16.08	4.19	8.17	4.24	2.37	0.72	43.31
2006	2.45	5.63	16.50	4.31	8.59	4.40	2.45	0.73	45.06
2007	2.74	5.90	16.91	4.44	9.00	4.56	2.52	0.75	46.81
2008	3.03	6.17	17.32	4.56	9.42	4.72	2.59	0.76	48.57
2009	3.31	6.43	17.74	4.69	9.83	4.89	2.67	0.77	50.32
2010	3.60	6.70	18.15	4.81	10.25	5.05	2.74	0.78	52.08
2011	3.62	6.95	18.26	4.85	10.49	5.19	2.77	0.79	52.92
2012	3.64	7.20	18.36	4.89	10.73	5.34	2.80	0.79	53.75
2013	3.67	7.44	18.47	4.93	10.97	5.50	2.83	0.80	54.61
2014	3.69	7.69	18.58	4.97	11.21	5.66	2.86	0.80	55.46
2015	3.71	7.94	18.69	5.01	11.45	5.78	3.00	0.81	56.38
2016	3.73	8.13	18.79	5.05	11.69	5.89	3.05	0.81	57.15
2017	3.75	8.32	18.90	5.09	11.94	6.02	3.09	0.82	57.92
2018	3.78	8.51	19.01	5.13	12.18	6.14	3.14	0.82	58.70
2019	3.80	8.70	19.11	5.17	12.42	6.26	3.18	0.83	59.47
2020	3.82	8.89	19.22	5.21	12.66	6.39	3.23	0.83	60.24
2021	3.88	9.08	19.29	5.25	12.96	6.50	3.28	0.84	61.07
2022	3.94	9.27	19.36	5.29	13.26	6.62	3.33	0.84	61.90
2023	3.99	9.46	19.42	5.33	13.56	6.74	3.38	0.84	62.73
2024	4.05	9.65	19.49	5.37	13.86	6.86	3.44	0.84	63.56
2025	4.12	9.75	19.62	5.41	13.88	6.92	3.47	0.85	64.02
2026	4.20	9.84	19.76	5.46	13.89	6.98	3.51	0.86	64.50
2027	4.27	9.94	19.89	5.52	13.91	7.04	3.54	0.87	64.98
2028	4.35	10.04	20.02	5.57	13.93	7.09	3.58	0.87	65.46
2029	4.42	10.14	20.16	5.63	13.95	7.15	3.61	0.88	65.94
2030	4.50	10.24	20.29	5.69	13.96	7.21	3.65	0.89	66.43
2031	4.57	10.35	20.42	5.74	13.98	7.26	3.69	0.90	66.91
2032	4.65	10.45	20.56	5.80	14.00	7.32	3.72	0.91	67.40
2033	4.72	10.55	20.69	5.86	14.02	7.38	3.76	0.92	67.90
2034	4.80	10.66	20.82	5.92	14.03	7.44	3.80	0.93	68.39
2035	4.87	10.77	20.95	5.98	14.05	7.50	3.84	0.94	68.89
2036	4.95	10.87	21.09	6.04	14.07	7.56	3.87	0.95	69.39
2037	5.02	10.98	21.22	6.10	14.09	7.62	3.91	0.96	69.89
2038	5.09	11.09	21.35	6.16	14.10	7.68	3.95	0.97	70.40
2039	5.17	11.20	21.49	6.22	14.12	7.74	3.99	0.98	70.90
2040	5.24	11.32	21.62	6.28	14.14	7.80	4.03	0.98	71.42
2041	5.32	11.43	21.78	6.34	14.15	7.87	4.07	0.99	71.96
2042	5.39	11.54	21.94	6.41	14.17	7.93	4.11	1.00	72.50
2043	5.47	11.66	22.10	6.47	14.19	7.99	4.15	1.01	73.05
2044	5.54	11.77	22.26	6.54	14.21	8.06	4.19	1.02	73.59
2045	5.62	11.89	22.42	6.60	14.22	8.12	4.24	1.04	74.15
2046	5.69	12.01	22.58	6.67	14.24	8.19	4.28	1.05	74.70
2047	5.77	12.13	22.74	6.73	14.26	8.25	4.32	1.06	75.26
2048	5.84	12.25	22.90	6.80	14.28	8.32	4.37	1.07	75.82
2049	5.92	12.38	23.06	6.87	14.29	8.39	4.41	1.08	76.38
2050	5.99	12.50	23.22	6.94	14.31	8.45	4.45	1.09	76.95
2051	6.05	12.62	23.45	7.01	14.45	8.54	4.50	1.10	77.72
2052	6.11	12.75	23.69	7.08	14.60	8.62	4.54	1.11	78.50
2053	6.17	12.88	23.92	7.15	14.74	8.71	4.59	1.12	79.28
2054	6.23	13.01	24.16	7.22	14.89	8.80	4.63	1.13	80.08

Source:
CWA 2005 Appendix E, Table E-1. Data extrapolated from 2050 to 2054 using a 1% annual growth rate.

1029 **Table 6 - CWA 50-Year Comparison of Average Day Supply and Demand in MGD.**

Year	Demand	Supply	Deficit
2004	41.55	45.06	N/A
2005	43.31	45.22	N/A
2006	45.06	47.40	N/A
2007	46.81	47.57	N/A
2008	48.57	66.03	N/A
2009	50.32	66.20	N/A
2010	52.08	66.40	N/A
2011	52.92	66.32	N/A
2012	53.75	66.46	N/A
2013	54.61	66.63	N/A
2014	55.46	66.79	N/A
2015	56.38	66.33	N/A
2016	57.15	66.33	N/A
2017	57.92	66.33	N/A
2018	58.70	66.33	N/A
2019	59.47	66.33	N/A
2020	60.24	66.55	N/A
2021	61.07	66.55	N/A
2022	61.90	66.55	N/A
2023	62.73	66.55	N/A
2024	63.56	61.97	1.59
2025	64.02	61.97	2.05
2026	64.50	50.97	13.53
2027	64.98	50.97	14.01
2028	65.46	50.97	14.49
2029	65.94	50.97	14.97
2030	66.43	45.97	20.46
2031	66.91	45.97	20.95
2032	67.40	45.97	21.44
2033	67.90	45.97	21.93
2034	68.39	45.97	22.42
2035	68.89	40.97	27.92
2036	69.39	40.97	28.42
2037	69.89	40.97	28.92
2038	70.40	40.97	29.43
2039	70.90	40.97	29.94
2040	71.42	35.97	35.45
2041	71.96	35.97	35.99
2042	72.50	35.97	36.53
2043	73.05	35.97	37.08
2044	73.59	35.97	37.63
2045	74.15	30.97	43.18
2046	74.70	30.97	43.73
2047	75.26	30.97	44.29
2048	75.82	30.97	44.85
2049	76.38	30.97	45.42
2050	76.95	30.97	45.98
2051	77.72	30.97	46.75
2052	78.50	30.97	47.53
2053	79.28	30.97	48.31
2054	80.08	25.67	54.41

3.4 Environmental Considerations

The following sections describe environmental considerations, including hydrologic, water quality, groundwater, and biological effects.

3.4.1 Project Baseline

The Baseline Condition is the scenario of future operations of Lake Tapps Reservoir most likely to occur without the WSP. A Baseline Condition is necessary to compare the probable environmental conditions with and without the WSP. Thus, the Baseline Condition represents a starting point from which to evaluate the environmental benefits or harms of the WSP. The Baseline Condition is a tool for analysis and evaluation of the project and as a whole does not in any way limit actual operations of the project, though specific elements of the Baseline may be included as permit conditions.

Ecology views that the most likely scenario to occur without the WSP is that Lake Tapps would continue to be maintained by diverting water from the White River, but no hydropower would be generated. This scenario is the Baseline Condition used for evaluating the water right applications. Under the Baseline Condition, water diverted from the White River would be used to maintain water quality in the Lake (including the annual drafting and filling of the reservoir to prevent growth of aquatic vegetation), maintain recreational levels during the recreation season, and operate the fish screen in the diversion canal. PSE has taken the position that the existing water right as represented by the claims authorizes such uses even when hydropower is not produced. However, the existing claims do not specifically allow diversion of water for these uses and PSE has agreed to seek a change to the claims to allow, if not confirm, these uses.

Under the Baseline Condition, the operator of Lake Tapps would only be allowed to divert from the White River the quantity of water necessary to achieve these purposes. That quantity is not easily predictable because of the complex factors that affect lake water quality. The operator would need to perform a water quality study, including an evaluation of pollutant sources and the potential for source reduction, in order to determine the amount of diversion necessary to maintain lake water quality. Such a study would result in an adaptive management approach that may include maximum rates of diversion from the White River that vary seasonally or over longer periods of time.

For the purposes of modeling the Baseline Condition, a most-likely operating scenario was developed based on actual operations of Lake Tapps in the period following the cessation of hydropower generation. In addition, two additional operating scenarios representative of the upper and lower bound diversions scenarios were also evaluated to provide a conservative analysis with respect to the impacts caused by the WSP. These additional operating scenarios represent estimates of the upper and lower bounds on diversions from the White River to maintain water quality and recreation levels in Lake Tapps.

The baseline and upper and lower bound diversion scenarios differ in the amount of water that is diverted for maintaining water quality in Lake Tapps. Diversions made specifically for the purposes of maintaining water quality are considered to be water diverted above that which is necessary to simply maintain levels in Lake Tapps. This water is also referred to as “Flushing Flow” as it is water that is diverted into Lake Tapps and subsequently released at the tailrace after minimal storage. The significance of such diversions is unknown at this time, but is discussed conceptually in Section 3.4.3.1. The baseline and upper and lower bound diversion scenarios model water quality diversions as follows:

<u>Baseline Scenario</u>: This scenario represents the conclusion that flushing flows are beneficial to the lake, but the quantity of flushing necessary varies seasonally. The amount of flushing flow necessary to maintain lake water quality is assumed to vary seasonally for the following reasons:

- During the fall drawdown period, the lake mixes, a significant quantity of water is displaced from the lake, and additional diversions for flushing would conflict with the goal of lowering lake water level;
- During the winter, the lake is well mixed and is storing less water (making it easier to flush), algal growth is lower, and precipitation and other local inflows are higher. This combination of factors makes it likely that less White River water would be necessary for maintaining lake water quality.
- During summer a larger volume of water is retained in Lake Tapps than during the winter low pool period, therefore higher flows would be necessary to maintain an equivalent residence time in the lake; and
- During spring a large volume of White River water is diverted to refill the lake, although this water is stored in the lake instead of being released because its quantity is so large, it would serve to change lake water quality.

In order to model the Baseline Condition, the diversions necessary to maintain water quality need to be quantified seasonally. Monitoring conducted in the summer of 2005 indicates that, at least in the short term, Lake Tapps water quality was preserved by the post-hydropower operating conditions. Based on the assumption that this condition would continue to be the case in the longer term, the baseline scenario flushing flows were based on actual post-hydropower operations in 2004 and 2005. The baseline seasonal flushing flows were calculated as either the average diversion or tailrace release (rounded to the nearest 5 cfs) during each season as follows and are summarized in Table 7.

- During spring refill in 2004 and 2005, the average tailrace release was 70 cfs. During the summer high pool period in 2004 and 2005 the average tailrace release was 175 cfs. Since the reservoir level is generally either being increased or held constant during the spring-summer period any releases from the tailrace are essentially a flushing flow.
- During the fall drawdown period in 2004, the average tailrace release was 220 cfs, and the average diversion was 30 cfs. No flushing is anticipated to be necessary during Fall drawdown since tailrace releases greatly exceed diversions in order to lower the lake level.
- During the winter low pool period of 2004, there were no data available for the tailrace flows and the average diversion was 70 cfs. Diversion flows also include 20 cfs of flow used to operate the fish screen, so the amount flushing through the reservoir was assumed to be 50 cfs.

Table 7 - Flushing Flows Included in the Baseline Scenario.

Season	Modeled Dates	Flushing Flow in cfs
Spring Refill	March 1 to May 15	70 cfs
Summer Full Pool	May 15 to October 31	175 cfs
Fall Drawdown	November 1 to December 14	0 cfs
Winter Low Pool	December 15 to February 28	50 cfs

Upper Bound Diversion Scenario: This scenario represents the upper bound of diversions into Lake Tapps. Under this scenario, the assumed result of the water quality study is that higher flushing flows are necessary to maintaining water quality in Lake Tapps. Therefore, this scenario includes a "flushing flow" diversion of 375 cfs throughout the year (during periods when water is available according to the diversion priorities listed in Section 2.3.5).

Lower Bound Diversion Scenario: This scenario represents the lower bound of diversions into Lake Tapps. Under this scenario, the assumed result of the water quality study is that water quality in Lake

Tapps is impaired by White River diversions and/or that increased residence time results in an improvement of water quality in the lake. This scenario diverts only the quantity of water necessary to maintain lake levels during the target recreation season and to operate the fish screen. Releases from the lake only occur as needed to manage lake levels within the target range shown in Figure 4.

For modeling purposes, the following operational features were assumed as components of the Baseline and Upper and Lower Bound diversion scenarios:

- Reservoir elevations are governed by a rule curve that includes spring refill from March 1 to May 15 (with a target high pool date of April 15) and maintenance of recreational water levels from May 15 to October 31 of each year;
- Diversions of up to 500 cfs during the spring refill period;
- Diversions of up to 375 cfs are allowed for the remainder of the year to maintain lake levels;
- A changed water right claim allowing diversion from the White River for the uses described above;
- Replacement of the White River diversion dam with a new diversion dam that has an efficiency of 95 to 100 percent varying by month;
- Actual diversions from the White River that are always the maximum allowed by that scenario multiplied by the diversion dam efficiency;
- Compliance with Agency 10(j) MIFs for the Reservation Reach;
- Measures in place to reaerate tailrace discharges and prevent salmonids from entering the tailrace; and
- Releases from the reservoir occur throughout the day (rather than in hydropower peaks) with relatively smooth transitions between release rates.

3.4.2 Surface Water Hydrology

3.4.2.1 Existing Conditions

The project is located in the White River Watershed in WRIA 10. The White River, a main tributary of the Puyallup River, originates in Emmons and Fryingpan Glaciers of Mount Rainier and has a drainage area of 494 square miles. There are two major instream structures in the White River that have a significant influence on flows: 1) Mud Mountain Dam at RM 29.5, which is operated by the U.S. Army Corps of Engineers solely for flood control; and 2) the diversion dam at RM 24.3, which diverts water into Lake Tapps.

Water diverted from the White River at the diversion dam travels through an 8-mile-long flowline, that includes a fish screen and multiple sedimentation basins, before entering Lake Tapps. Lake Tapps is a 2,700-acre reservoir comprised of 13 dikes and is capable of impounding 46,700 acre-feet of water. The main outlet of Lake Tapps is the intake of PSE's White River Hydroelectric Project. The White River Hydroelectric Project releases up to 2,000 cfs through the tailrace canal to the White River at RM 3.6. Prior to 2004, the timing of releases from Lake Tapps was driven primarily by hydropower demand.

Historically, Lake Tapps Reservoir operated as an offline storage facility for the main purpose of hydropower generation. The reservoir is typically maintained at normal full pool (elevation 543 feet) through the summer and then is drawn down in winter for hydropower generation and to expose lake sediments to prevent growth of aquatic plants (see Figure 4). The normal winter pool elevation is 530 feet, although the minimum operation pool elevation if 515 feet. Theoretically, the hydropower intake can withdraw water from the lake from an elevation of 507 feet up to the water surface. However, the reservoir typically only draws from the upper 30 feet at full pool. Lake Tapps has not been operated according to a fixed rule curve, although the general pattern of maintaining high pool in summer and drawdown in winter has been consistently followed by PSE.

3.4.2.2 Methodology

To evaluate the impacts of the project on flows in the White River and Puyallup River, the applicant developed the Lake Tapps System Model using the Stella 7.0.1 software package. The Lake Tapps System Model is a daily-timestep, non-dimensional model that simulates flow or reservoir storage at select points between the diversion dam and the Puyallup River at Puyallup gage. The model routes water from one location to another according to logical statements based on the allowable diversion, a reservoir rule curve, minimum instream flows, etc.

Outputs from the model are time series of flow or reservoir elevation for the following locations:

- White River Reservation Reach;
- Lake Tapps water surface elevation;
- Lake Tapps Tailrace;
- White River at Auburn;
- Lower White River; and
- Lower Puyallup River

The primary inputs to the model are observed time series of flow based on USGS gage records at the upstream boundary and other tributary locations. The model uses the following input time series:

- White River near Buckley;
- Boise Creek at Buckley;
- Puyallup River at the White/Puyallup Confluence;
- Local Inflow to Lake Tapps; and
- Local Inflow at Auburn.

Model input for the White River near Buckley and Boise Creek at Buckley are historical flow data from the USGS gages at those locations. The Puyallup River at the White/Puyallup Confluence time series is calculated by subtracting USGS gage data for the White River at Auburn and Lake Tapps Reservoir Diversion at Dieringer from the gage data at the Puyallup River at Puyallup.

The local inflow at Auburn series is a synthetic time series calculated by mass balance on the reach of the White River between the White River at Buckley and the White River at Auburn gage (see Ramey and Yoder 2004 for additional details). The local inflow at Auburn time series represents the losses and gains that occur in the White River, as well as gage error. Local inflow at Auburn averages 101 cfs and is higher in winter than in summer, as would be expected. The local inflow at Auburn term ranges from -610 cfs to 3,400 cfs, but 80 percent of the inflow values are between -50 cfs and 140 cfs.

A similar local inflow term was calculated for Lake Tapps reservoir by applying a mass balance to the lake. The local inflow to Lake Tapps term represents measurement error, evaporation, precipitation, leakage to groundwater, and surface water inflows to the lake or the diversion canal (Ramey and Yoder 2004). The Lake Tapps local inflow series is sensitive to measurement error in the water surface elevation of Lake Tapps. A small measurement error represents a large volume of water and can create large positive or negative inflow to the lake. The average local inflow to Lake Tapps is 46 cfs and is higher in winter than in summer. During some summer months, the average inflow series is negative indicating that losses to evaporation and recharge outweigh any inflows. The local series ranges from -3,075 cfs to 2,268 cfs, but 80 percent of the values are between -150 cfs and 250 cfs. The large range in the Lake Tapps local inflow series is a limitation of the model and causes some counterintuitive results such as a few days of large changes in flow in the Puyallup River with the WSP.

The water quantity model has several other limitations that were considered in interpreting the results:

- Puyallup River at Puyallup MIF used in water quantity model is a step function rather than ramped smoothly as identified in WAC 173-510-030 and the *Puyallup River Basin Instream Resource Protection Program* (Ecology 1980). A step-function MIF conservatively overestimates MIF excursions in fall and underestimates them in spring.
- Reservoir elevations in Lake Tapps are calculated based on a relationship between storage volume and water surface elevation determined from a bathymetric study in 1956.
- The model does not directly simulate some hydrologic processes such as evaporation, leakage, direct precipitation, but instead lumps them together in the local inflows series. As these processes are unlikely to change significantly as a result of the WSP this is not a significant limitation.

Scenarios Evaluated with Water Quantity Model

The Lake Tapps Systems Model was used to evaluate the impact of the WSP relative to the Baseline Condition which includes maintenance of lake levels for recreation, and maintenance of lake water quality through seasonally varying flushing flows as defined in Section 3.4.1. The term flushing flow refers to water diverted into Lake Tapps that is ultimately released through the tailrace structure at the north end of the lake. Three scenarios were simulated for the Baseline Condition to provide a range of outcomes to bracket the analysis:

- Baseline - seasonally varying flushing flows
- Upper Bound - a constant flushing flow of 375 cfs
- Lower Bound - no flushing flow

For each Baseline scenario, a with WSP scenario was created that maintained the flushing flow diversions of the baseline, but simulated the addition of the WSP and all its elements (such as the higher Modified 10(j) MIFs, MIF Compliant Diversion, the water supply withdrawal, etc.). Thus, a six scenarios were modeled (Baseline diversion with and without the WSP, Upper Bound diversion with and without the WSP, and Lower Bound diversion with and without the WSP).

The WSP scenario adds a water supply withdrawal from the lake of 150 cfs from August to October and 83.3 cfs for the remaining nine months. This pattern of withdrawal reflects the peak demands that typically occur in summer, while maintaining an annual average withdrawal of 100 cfs.

Each model run simulates the entire period of record from WY 1991 through 2002. This period includes normal, dry and drought conditions, but on average is drier than normal.

3.4.2.3 Potential Effects of the WSP

Baseline Scenario with the WSP

Water Supply Availability

Sufficient water was available in the baseline scenario to meet water supply and source exchange needs. Although the water surface elevation of Lake Tapps was frequently drawn below the recreational target elevation in late summer and early fall, the water surface elevation never approached the minimum elevation for water supply withdrawal of 515 feet. This indicates that water would reliably be available for water supply and source exchange even during drought conditions.

White River Reservation Reach

The WSP would have a beneficial impact to the Reservation Reach as low flows would increase as a result of the MIF compliant diversion mitigation element and the Modified 10(j) MIFs for the White River. Under the Baseline scenario, the WSP increased the average flow in the Reservation Reach by 2 cfs (Table 8).

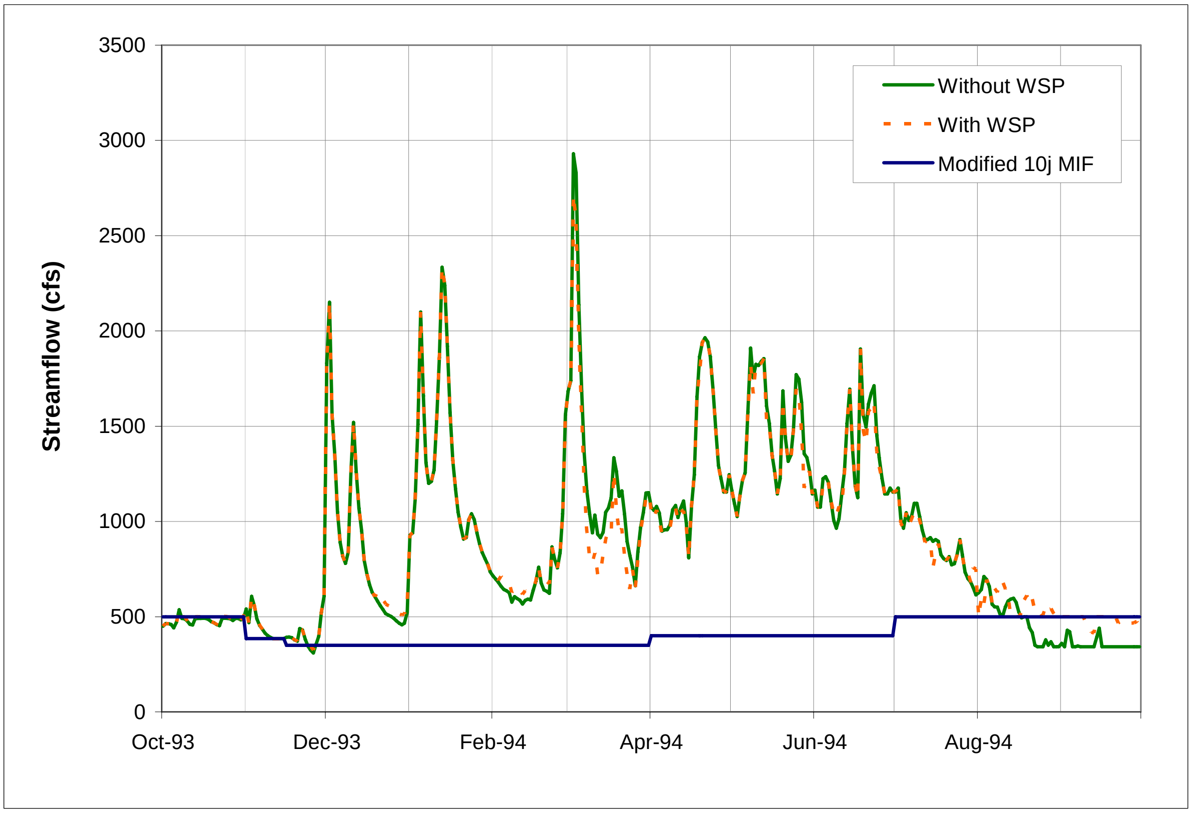

Figure 6 - Effect of the WSP on flow in the Reservation Reach for the Baseline Scenario in WY 1994 (Drought).

As shown in Figure 6, most of the year there is no change in flow as a result of the WSP. The slight increases in flow during low flow periods in the winter and early spring results from the MIF Compliant Diversion mitigation element. During these periods the Puyallup River is below the MIF (see Figure 9) so the project reduces its diversion resulting in an increase in flows in the White River. Such MIF violations can occur any time of year, but in WY 1994 they primarily occurred in the winter and early spring. In the summer, the WSP would increase flows to at least 500 cfs to comply with the Modified 10(j) MIF in the Reservation Reach. Although less evident in Figure 6, the WSP does decrease flows in the Reservation Reach during rare occurrences where the White River and Puyallup River MIFs are met, but local inflows plus the baseline diversion are insufficient to provide water supply and maintain the reservoir level. Thus, more diversion is necessary to supplement the WSP.

The model results indicate that average flow in the Reservation Reach would increase slightly under the Baseline scenario (Table 8). Increases in flow occur when water temperature is high, and when flows in the Puyallup River are projected to be below the MIF. These are critical periods for the river, so it is a significant benefit that the increase in flow is targeted at these periods.

Historically, the average flow was 530 cfs below the diversion dam and 980 cfs in the diversion canal. As shown in Table 8, all of the scenarios with and without the WSP result in significantly increased flows in the White River, more than doubling the flow. This would be a tremendous benefit to the river.

Table 8 - Effect of the WSP on Average Flow in Reservation Reach and in the Diversion Canal.

Scenario		Average Flow in cfs	
		White River below Diversion	Canal Diversion
Historical Data		530	980
Baseline	w/o WSP	1314	153
	with WSP	1316	151
Upper Bound Diversion	w/o WSP	1117	350
	with WSP	1159	308
Lower Bound Diversion	w/o WSP	1397	71
	with WSP	1346	121

There would be periods when flows in the Reservation Reach would decrease as a result of the WSP. During MIF excursions with the WSP operative, Lake Tapps reduces its diversion and thus the water supply withdrawal is taken from storage, drawing down the reservoir. Following periods when MIFs are not met on the White or Puyallup River and diversion to Lake Tapps has stopped, the WSP would divert additional water to refill the reservoir. This diversion would be greater than would have otherwise been the case if the diversion had not been reduced to avoid the MIF excursion. Typically, the reduction in flows following mitigation would be less than 200 cfs and would last for less than 7 days.

Although flows in the White River diversion canal are not a priority when examining the potential impacts of the WSP, it is important to discuss the modeled diversion flows in terms of how the model operates the White River diversion based on the operating rules outlined for the baseline and WSP scenario (See sections 2.2.3 and 2.3.3). The average White River diversion for the baseline and the Upper and Lower Bound diversion scenarios with and without the WSP are outlined in Table 9 according to the rule curve periods. Under the baseline scenario, the average diversion during the Spring Refill period is 271 cfs without the WSP, and 299 cfs with the WSP. During all other operating periods, the average diversion is less with the WSP, due to the more restrictive operating rules placed on the WSP (e.g. Modified 10j Flows). The average summer diversion under the baseline scenario with the WSP (157 cfs) is less than the flushing flow allowed for this period (175 cfs because MIF violations in the Puyallup River during late summer prevent diversions for any reason.

Table 9 - Average Diversion Canal Flows by Season

Scenario		Average Flow in cfs			
		Spring Refill	Summer Full pool	Fall Drawdown	Winter Low pool
Baseline	w/o WSP	271	173	21	70
	with WSP	299	157	20	65
Upper Bound Diversion	w/o WSP	481	295	322	355
	with WSP	431	242	315	326
Lower Bound Diversion	w/o WSP	196	53	19	20
	with WSP	298	113	19	20

<u>Lake Tapps Reservoir</u>

Under the agreement between PSE and Lake Tapps homeowners, the water level in Lake Tapps would be maintained at recreational levels (between 541.5 and 543 feet) from April 15 to October 31. The water supply withdrawal and associated mitigation elements would cause drawdown from target recreational levels by increasing the withdrawals from the lake, and decreasing the amount of water available for diversion into the lake. The effect of the WSP on summer lake water levels with and without the WSP is shown in Figure 7. In this example, the lake would fill on schedule (April 15) but would be involuntarily drawn down from recreational levels, starting in mid-August. In other cases, the lake would fill later than planned, but almost always before Memorial Day. Figures of lake water levels for each scenario and each year are shown in Aspect Consulting 2005.

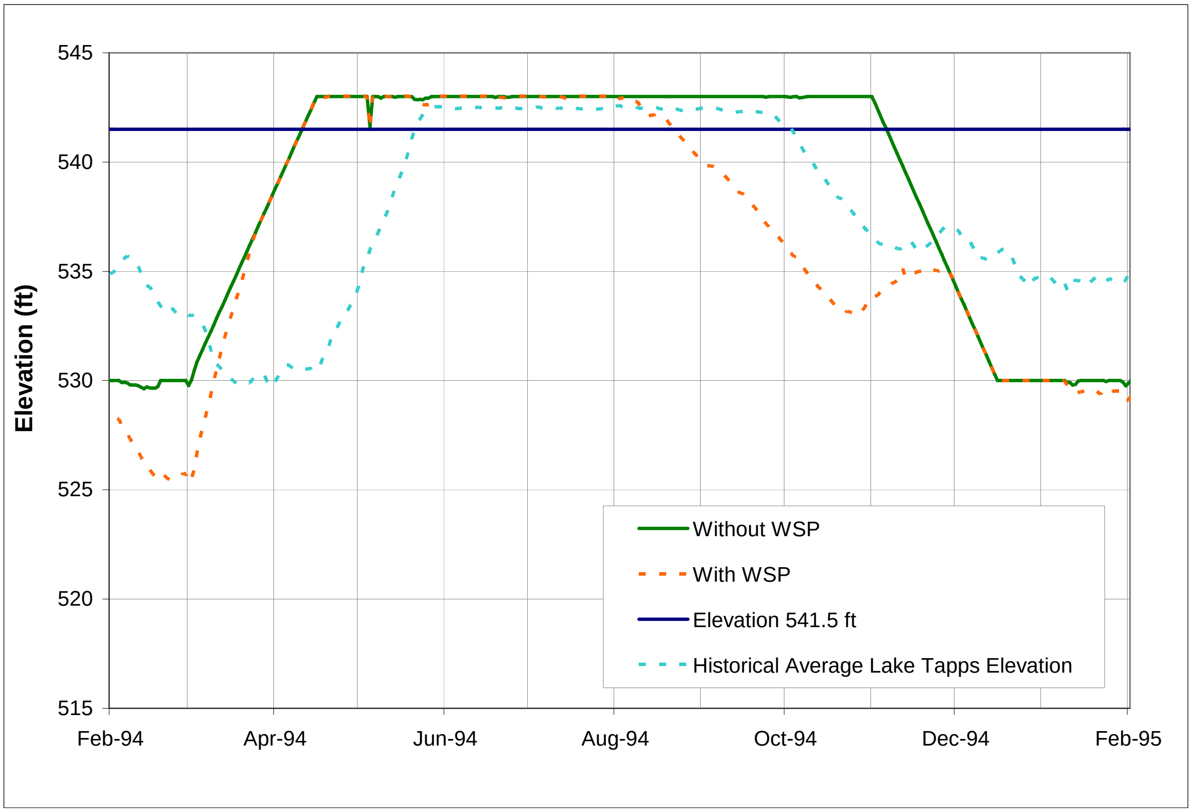

Figure 7 - Effect of WSP on Lake Tapps Water Levels for the Baseline Scenario in 1994 (Drought)

The impact of the WSP on recreational levels was quantified by counting the number of days between Labor Day and Memorial Day when the model predicted reservoir levels would be below 541.5 feet. This analysis was performed for each year for the Baseline and Upper and Lower Bound diversion scenarios. The results are presented in Table 10.

Overall, the 1991 to 2002 period included in the model is drier than normal. Statistically, one would expect that a 12-year simulation period would include 3 wet years, 6 normal years, 1.8 dry years and 1.2 drought years. However, based on total runoff volume in a water year, there were 4 wet years, 4 normal years, 2 dry years and 2 drought years between WY 1991 and 2002. It is important to consider that this period is drier than normal when evaluating average or total model results for the period.

Most of the time recreation between Memorial Day and Labor Day would not be impacted by operation of the WSP. During two drought years and one normal year in the period evaluated, the drawdown would impact recreation by dropping lake levels below 541.5 feet for a portion of the recreation period. The degree that recreation would be impacted depends on the unique climate conditions of a particular year, and the diversion scenario. WY 1994 is a typical drought year that is used as the example of a drought throughout this ROE. Atypical fall releases from Mud Mountain Reservoir during the fall of WY 2001 exacerbated the impacts of the 2001 drought. Therefore, WY 2001 may not be indicative of typical drought-year impacts. WY 1995, a statistically normal year with a normal fall, had below-normal streamflow in both August and September, which are responsible for the recreation impacts suggested by the model results.

Table 10 - Effect of the WSP on Recreation in Lake Tapps, Baseline Scenario

Water Year	Climate Description	Days from Memorial Day to Labor Day when Reservoir is below Recreational Target of 541.5 ft
1991	Wet, normal spring, dry fall	0
1992	Dry, normal spring, dry fall	0
1993	Dry, dry spring, normal fall	0
1994	Drought, wet spring, drought fall	14
1995	Normal, normal spring, normal fall	8
1996	Wet, normal spring, normal fall	0
1997	Wet, dry spring, wet fall	0
1998	Normal, normal spring, dry fall	0
1999	Wet, wet spring, normal fall	0
2000	Normal, normal spring, wet fall	0
2001	Drought, drought spring, drought fall	22
2002	Normal, normal spring, wet fall	0
Total (number days below 541.5 out of 1,244)		44
Percentage of days below 541.5 ft		3.6 %

Notes:
The climate description uses the following categories: Wet = percent exceedance of less than 25 percent, Normal = 25 to 75 percent, Dry = 75 to 90 percent, Drought = greater than 90 percent. The climate description is based on the average annual flow, followed by the spring 7-day low flow and fall 7-day low flow.

In almost every year the reservoir would not remain within the recreational target range for the full duration of April 15 to October 31. However, in most years, recreation would not be impacted between Memorial Day and Labor Day. Typically, the water supply demand, in addition to the higher Modified Agency 10(j) MIF and the foregone diversions of the MIF Compliant Diversion mitigation element, would cause the reservoir to be involuntarily drawn down before the target date of October 31. In drought years, involuntary draw down could begin as early as the first week of August. More typically, draw down would begin in late August to mid-September. In some years, rains would return in September and the reservoir could refill to recreational levels. However, more typically the drawdown would continue until fall drawdown begins November 1. In the worst cases, drawdown would reach 3 to 4 feet below the recreational target at Labor Day and up to 10 feet below by the end of October. But these worst cases would happen in extreme conditions, expected to occur less than 1 in ten years.

Reservoir drawdown is not limited to the summer recreation period. Drawdown also would occur during draft, winter low pool, and refill periods constituting the remainder of the year. However, water levels during these periods are normally below the recreational level and any additional drawdown during these periods was not considered an impact to recreation.

<u>Lower White River</u>

The effect of the WSP on flow in the lower White River in WY 1994, a drought year, under the Baseline scenario is shown in Figure 8. Hydrographs for other years and scenarios are presented in Aspect Consulting 2006.

In general, the impact of the WSP on flow in the lower White and Puyallup Rivers depends on whether the Puyallup River is below the MIF. If the Puyallup River is at or above the MIF, then the impact of the project generally would be a reduction in daily average flow in the lower White River equal to the water supply withdrawal (modeled as either 83.3 or 150 cfs depending on the season).

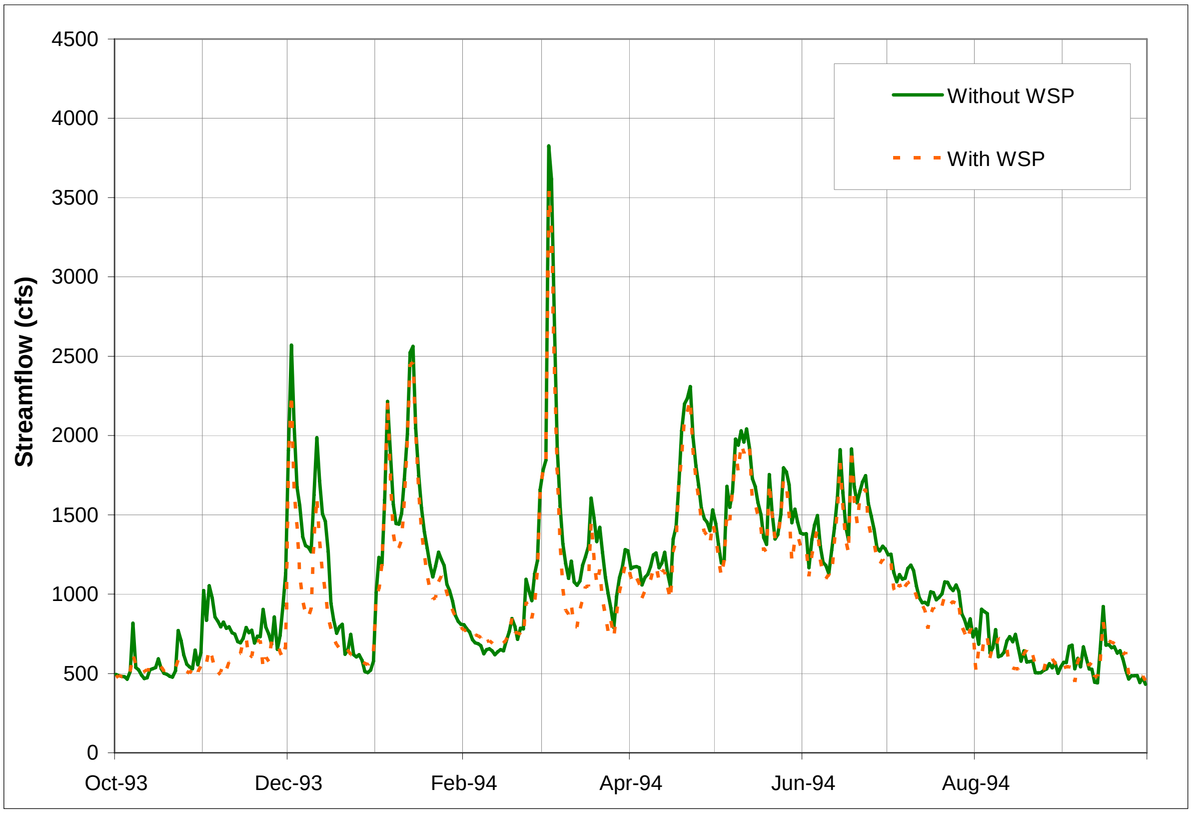

Figure 8 - Effect of the WSP on Flow in the Lower White River for the Baseline Scenario in WY 1994 (Drought).

When the Puyallup River is below the MIF, the MIF Compliant Diversion mitigation element is triggered and the project curtails diversion from the White River to the extent necessary to meet the MIF. During winter, spring, and summer, the project does not release any extra water from Lake Tapps specifically to meet the MIF. During individual MIF excursions, flow in the lower White River could be higher, lower, or about the same, but overall the project increases flow during MIF excursions. During the fall, the project would release additional water (up to 50 cfs in October, and up to 300 cfs through fall drawdown) to avoid causing MIF violations. The maximum increase in flow caused by the WSP was 402 cfs.

Immediately following periods of mitigation, more water would be diverted into the reservoir than would have otherwise occurred without the WSP. This would occur if the WSP has drawn the reservoir down and the reservoir begins to store water to return to the target reservoir elevations. The decrease in flow caused by the WSP can be seen in Figure 9 in November and December, and again in early March.

The change in flows during these periods can equal up to the diversion cap plus any local inflow into the lake plus any reduction in releases from storage. Because the Lake Tapps balance term contains adjustments for gage error and thus varies widely, the model predicts changes in White River flow that are greater than would be expected to occur. For example, the maximum decrease in flow in the lower White River was modeled as 1,305 cfs. On this occasion, diversion from the White River without the WSP was 20 cfs and the Lake Tapps balance term was 1,038 cfs so total inflow to the lake was 1,058 cfs and the release from the Lake was 1,305 cfs. On this particular day, flows in the Puyallup River at Puyallup are near the MIF. With the WSP, the Fall Drawdown Plan releases are in effect, requiring a release of 27 cfs and no diversion from the White River is allowed. Since with the WSP the reservoir would be drawn down below the target elevation, all inflows would be stored. Thus the model predicts that the release would drop from 1,305 cfs without the WSP to 0 cfs with the WSP for this day.

It is unlikely that local inflows to Lake Tapps would really be as high as 1,038 cfs, so the total change in flow is overestimated. For most of the year, a reasonable upper bound for the maximum decrease in flow in the lower White River as a result of the WSP is equal to the diversion cap plus local inflow (100 or 200 cfs at most). During fall drawdown, the upper bound for the maximum change in flow would be the diversion cap plus local inflow plus about 300 to 330 cfs released from storage for draw down.

<u>7Q10 & 7Q20</u>. Ecology analyzed the effect of the WSP on the 10-year, 7-day low flow (7Q10) and 20-year, 7-day low flow (7Q20) by performing statistical analyses on 12 years of model output (Aspect Consulting 2005). The limitations of this technique are that the results do not correspond directly to the previous estimates of 7Q10 and they are statistically weak because only 12 years of data were used to predict low flows with recurrence intervals of 10 and 20 years. Given these limitations, the estimates of 7Q10 and 7Q20 should be viewed as an indicator of the potential impact rather than a quantitative prediction of the impact.

Low flows were calculated for Baseline scenario with and without the WSP. In both the Lower White River and the Puyallup River the 7Q10 and 7Q20 flows increased as a result of the WSP. In the lower White River the 7Q10 increased from 315 cfs without the WSP to 332 cfs with the WSP. Similarly, the 7Q20 increased from 293 cfs to 312 cfs. A similar increase, but of smaller magnitude, also occurs for the 7Q10 and 7Q20 flows in the Puyallup River at Puyallup. The increase in low flows with the WSP is caused by the Modified 10(j) MIFs, MIF Compliant Diversion, and Fall drawdown mitigation elements.

<u>Lower Puyallup River</u>

Model results indicate that the impact on flows in the lower Puyallup River would be similar to that in the lower White River except that the relative magnitude of change would be lower because of inflow from the mainstem Puyallup and tributaries. The effect of the WSP on flow in the Puyallup River in WY 1994, under the Baseline scenario is shown in Figure 9 below.

In general, flow in the lower Puyallup River would be reduced by the magnitude of the water supply withdrawal. However, during MIF excursions, the flow could be higher, lower, or about the same as the baseline conditions, but overall would be higher. During periods when the reservoir has been drawn down and would be attempting to refill, the change in flow could be greater than the amount of the water supply withdrawal. A histogram and cumulative distribution function for the change in daily average streamflow at the Puyallup River at Puyallup is presented on Figure 10.

The WSP would increase flow in the lower Puyallup 9 percent of the time, reduce flow by between 0 and 150 cfs 70 percent of the time, and reduce flow by more than 150 cfs 21 percent of the time. The model predicts that maximum reduction in flow would be 1,305 cfs. This prediction is likely an overestimate as discussed for the White River because it assumes extremely high inflows to Lake Tapps other than flows from the White River.

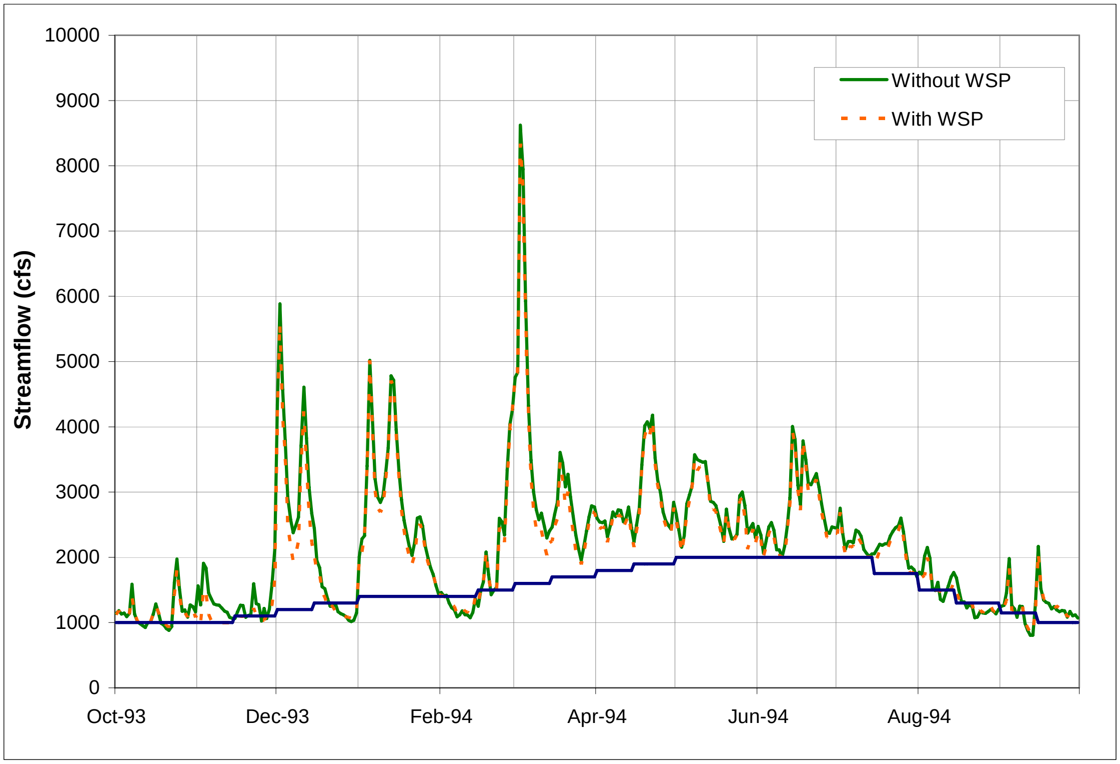

Figure 9 - Effect of the WSP on Flow in the Puyallup River at Puyallup for the Baseline Scenario in WY 1994 (Drought).

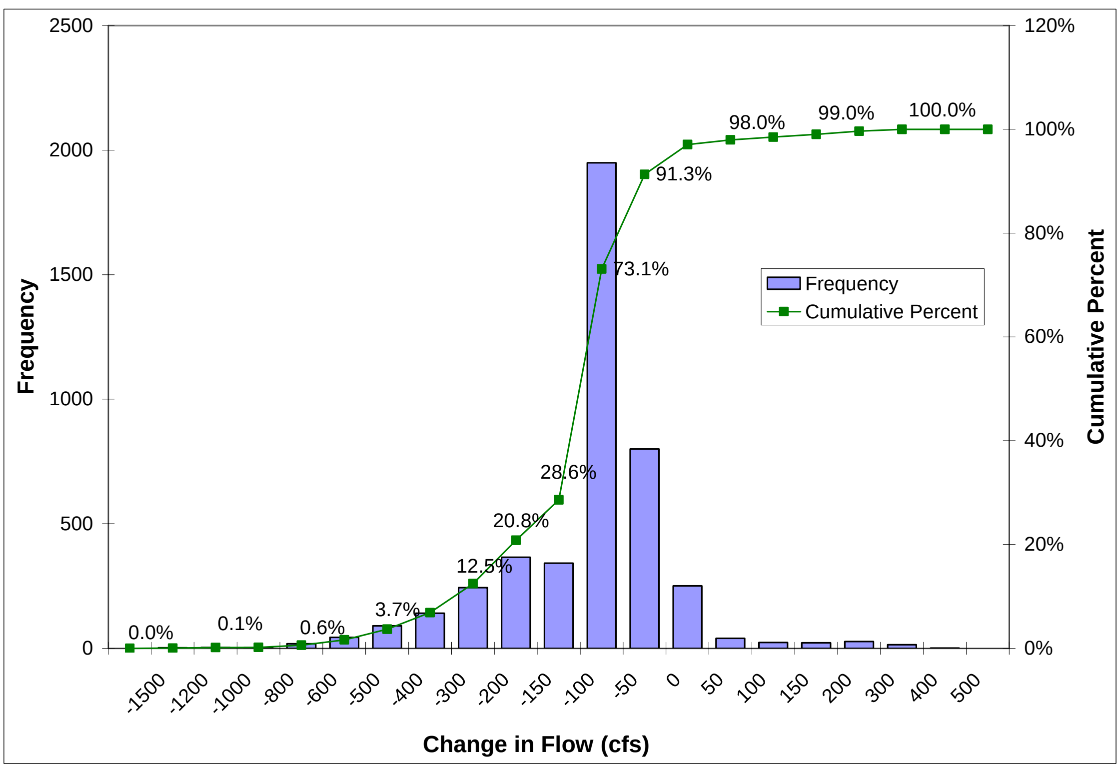

Figure 10 - Statistical summary of the change in Puyallup River flow as a result of the WSP for the Baseline Scenario.

Puyallup River MIF Excursions. Model results confirm that the WSP would have a positive impact in reducing the number and volume of Puyallup River MIF excursions (Table 11). The number of MIF excursions would be reduced by 15 percent and the volume of MIF excursions (expressed in acre-feet of shortfall) would be reduced by around 21 percent.

Table 11 - Effect of the WSP on the Number and Magnitude of MIF Excursions at the Puyallup River at Puyallup.

	Average Number of MIF Excursions per Year			Average Annual MIF Shortfall in acre-feet		
Scenario	without WSP	with WSP	Change	without WSP	with WSP	Change
Baseline	35.5	30	-5.5 (-15%)	13,343	10,483	2,860 (-21%)
Upper Bound Diversion	35.3	30	-5.3 (-15%)	13,420	10,466	2,954 (-22%)
Lower Bound Diversion	35.8	30	-5.8 (-16%)	13,259	10,516	2,743 (-21%)

The project's approach for complying with the Puyallup River MIF relies on the amount of water naturally in the river system. During a projected MIF excursion the project would activate the MIF compliant diversion mitigation element and thus curtail diversion from the White River. Overall, this approach reduces the number of MIF excursions and increases the flows on days with MIF excursions. The MIF compliant diversion is particularly effective at reducing the number and magnitude of MIF excursions in spring (Table 12). The MIF compliant diversion also improves MIF compliance during Winter and Summer, but does little during the Fall.

Table 12 - Seasonality of MIF Excursions at the Puyallup River at Puyallup under Baseline Scenario

Baseline Scenario	Total Days of MIF Excursion				
	Fall	Winter	Spring	Summer	Total
without WSP	122	105	97	102	426
with WSP	120	92	55	93	360

While overall the modeling shows the WSP would reduce MIF excursions, it should be noted that it does cause or exacerbate MIF excursions on some days because of periodic releases of flow from the reservoir that would no longer occur with the water supply project in operation. PSE, however, is not obligated to operate the reservoir to release water in this manner. On average, the WSP avoids 8.5 MIF excursions per year, but causes 3.0 new ones, resulting in the 5.5 net reduction shown in Table 11. In the Baseline scenario, the largest MIF excursion that was corrected by the WSP was 402 cfs, the largest MIF excursion caused or exacerbated by the WSP was 204 cfs.

Water Levels in the Lower Puyallup. The effect of the WSP on water levels in the lower Puyallup River is important for evaluating the impact on habitat restoration projects and aquatic habitat in general. The change in stage was evaluated by using the rating curve developed by the USGS for the Puyallup River at Puyallup gage to convert model results from flow to stage. The resulting stage time series was examined statistically to determine magnitude and frequency of changes in stage. Figure 11 is a histogram of the change in stage at the Puyallup River as a result of the water supply.

On average, the WSP would reduce the stage in Puyallup River by 0.09 feet, or 1.08 inches. Model results indicate that the maximum decrease in stage would be 1.5 feet. During mitigation, the project would increase stage by up to 0.5 feet. As shown in Figure 11, increases in stage would occur 5.2 percent of the time, stage would decrease by between 0 and 0.2 feet during 74.2 percent of the time, and decreases greater than 0.2 feet would occur the remaining 20.6 percent of the time. As with other impacts, the change in stage in the Puyallup River would be greatest near the confluence with the White River and would diminish downstream.

<u>Groundwater</u>

Under current operating conditions, the reservoir accounts for approximately 5 to 35 percent of the average annual recharge to groundwater occurring from the Lake Tapps Uplands. The remaining 65 to 95 percent of recharge results from the infiltration of precipitation falling on the uplands outside of the reservoir. Groundwater recharge from the reservoir is directly related to the reservoir level and the resulting hydraulic gradient between the reservoir and points of groundwater discharge (e.g., Coal Creek Springs, Salmon Springs, etc.). Relative to the mean reservoir level of 538 feet, a one foot drop in reservoir level would result in an approximately 0.3 percent reduction in the gradient (and resulting leakage) between Lake Tapps and the points of groundwater discharge. Because of the long travel time of groundwater within the aquifer(s), a short-term drop in the elevation of the reservoir should mainly be viewed in terms of its effect on the average water level in the lake over the long-term.

Under the proposed changes in operations associated with the WSP and the lake level agreement between PSE and the homeowners, the average annual water level would be slightly lower, but would, remain within one foot of average water levels under current conditions. Average water level with and without the WSP is shown in Table 13.

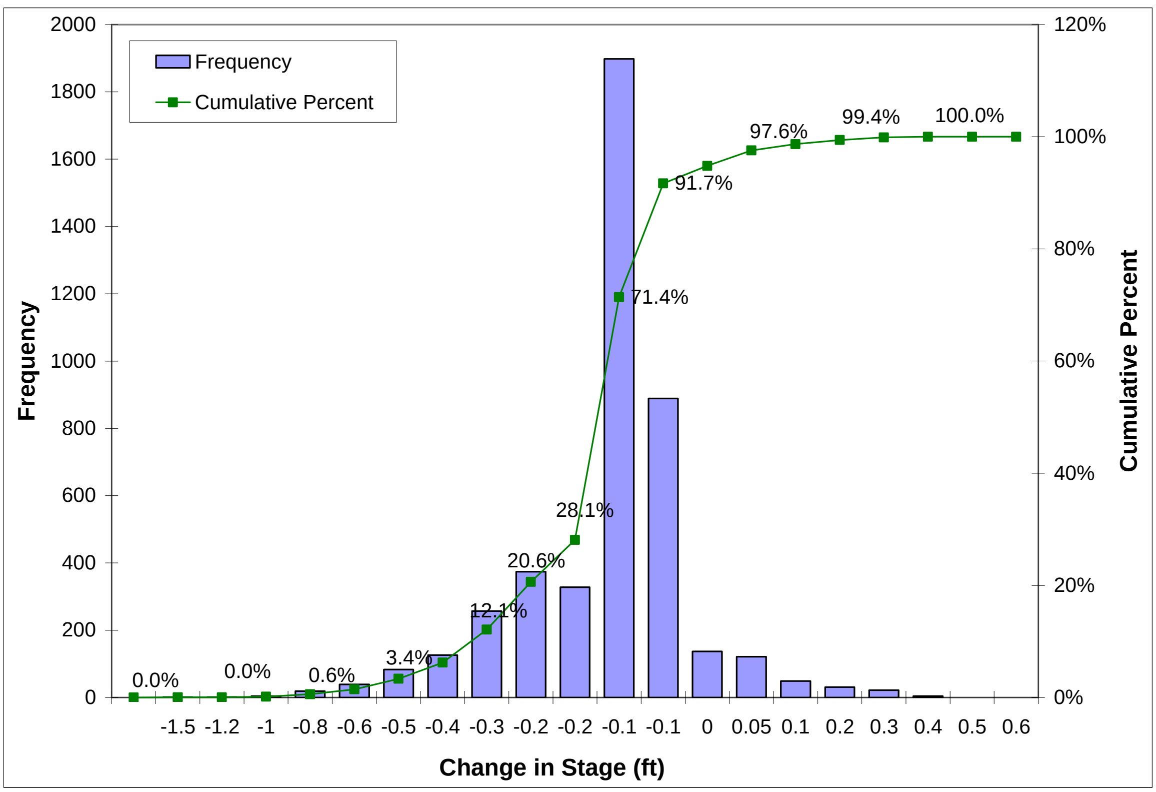

Figure 11 - Effect of the WSP on stage in the Puyallup River for the Baseline Scenario.

The average water level with the WSP (Table 13) would be only slightly less than the historical average water level from 1990 to 2002 of 537.8 feet. Thus, on average, groundwater recharge from Lake Tapps would be the same as has occurred historically. The WSP does cause a reduction in the average water level, and that reduction would decrease to some degree the amount of recharge from the lake. The reduction in average water level caused by the WSP would be about 1.0 feet. However, this would result is an approximate decrease in recharge of less than 0.3 percent.

Table 13 - Effect of the WSP on the Average Water Level in Lake Tapps.

Scenario	Water Surface Elevation in feet without WSP	with WSP	Change
Baseline	538.6	537.6	-1.0
Upper Bound Diversion	538.7	538.0	-0.7
Lower Bound Diversion	538.5	537.0	-1.5

On a shorter time frame, there would be periods in late summer when drawdown would exceed 1 foot. Under drought conditions, the reservoir water level may be 3 or more feet lower than current operational levels for two or more months (typically mid-August to October). Although drawdown of this magnitude would result in decreased recharge to the underlying aquifers and surface water springs, the magnitude of the reduced recharge would be relatively insignificant. The predicted worst case drawdown is an average of 4.97 feet over a period of 113 days. This would represent an approximately 1.5 percent decline in the contribution of Lake Tapps water to recharge over the 113-day time period. Given that leakage from Lake Tapps accounts for between 5 and 35 percent of total recharge from the Lake Tapps Uplands, the resulting reduction in net recharge from the uplands would be approximately 0.075 to 0.53 percent over the 113-day period, and 0.023 to 0.16 percent on an annual basis. This minor reduction in recharge would be expected to occur less than 1 out of ten years.

<u>Upper and Lower Bound Diversion Scenarios</u>

<u>Water Supply Availability</u>

As in the Baseline scenario, sufficient water was available both the Upper and Lower Bound diversion scenarios to meet water supply and source exchange needs.

<u>White River Reservation Reach</u>

As in the Baseline scenario, the WSP would have a beneficial impact to the Reservation Reach under the Upper Bound diversion scenario. Under the Upper Bound diversion scenario, the WSP increased the average flow in the Reservation Reach by 42 cfs (see Table 8). However, under the Lower Bound diversion scenario, the WSP would reduce flow in the Reservation Reach by 51 cfs (see Table 8).

Historically, the average flow below the diversion dam was 530 cfs. As shown in Table 8, the Upper and Lower Bound diversion scenarios result in significantly increased flows in the White River, approximately doubling the flow. Although modeling results for the Lower Bound scenario indicate that the WSP would cause a decrease of 51 cfs in the Reservation Reach, its worth noting that for this scenario the average flow in that reach, both with and without the WSP, is the highest of all scenarios.

The modeled canal diversions for the Upper and Lower Bound diversion scenarios are shown in Table 9. The average canal diversion flows allowed in each scenario are defined by the operating rules (see Sections 2.2.3 and 2.3.3) and the flushing flows allowed to maintain water quality in the lake (see Section 3.4.1). Under the Upper Bound diversion scenario, the average diversions with and without the WSP approach, but are less than, the 500 cfs diversion cap during spring refill and 375 cfs diversion cap for the remainder of the year. The average diversions with the WSP are less than the caps during all periods under this scenario.

Under the Lower Bound diversion scenario, the average diversions during the spring refill period are 303 cfs, and 340 cfs with and without the WSP, respectively. During all other periods the average diversions are less than the other scenarios (see Table 9).

Lake Tapps Reservoir

The impacts of the WSP under the Upper and Lower Bound diversion scenarios are similar to those presented for the Baseline scenario. Figures of lake water levels for each scenario and each year are shown in Aspect Consulting 2005.

As with the Baseline scenario, the impact of the WSP on recreational levels was quantified by counting the number of days between Labor Day and Memorial Day when the model predicted reservoir levels would be below 541.5 feet. This analysis was performed for each year of the Upper and Lower Bound diversion scenarios. The results for each scenario were identical to the Baseline scenario presented in Table 10.

Lower White River

The impacts of the WSP under the Upper and Lower Bound diversion scenarios are similar to those presented for the Baseline. Hydrographs for these scenarios are presented in Aspect Consulting 2005.

7Q10 & 7Q20. Low flows were calculated for the Upper and Lower Bound diversion scenarios, without and with the WSP. In both scenarios the 7Q10 and 7Q20 flows were slightly higher with the water WSP. For the Lower Bound Diversion, the 7Q10 and 7Q20 in the lower White River without the WSP would be 313 and 297 cfs, respectively, and would increase to 332 and 313 cfs, respectively, with the WSP. For the Upper Bound diversion scenario, the 7Q10 and 7Q20 in the lower White River without the WSP would be 316 and 296 cfs, respectively and would increase to 333 and 315 cfs with the WSP. Similar increases, but of smaller magnitudes, also occur for the 7Q10 and 7Q20 flows in the Puyallup River at Puyallup.

Lower Puyallup River

The impacts of the WSP under the Upper and Lower Bound diversion scenarios are similar to those presented for the Baseline. Figures of Lower Puyallup flows for each scenario and each year are shown in Aspect Consulting 2005.

Under the Upper Bound diversion scenario the WSP would increase flow in the lower Puyallup 8.7 percent of the time, reduce flow by between 0 and 150 cfs 73.6 percent of the time, and reduce flow by more than 150 cfs 17.7 percent of the time. Under the Lower Bound diversion scenario the WSP would increase flow in the lower Puyallup 6.0 percent of the time, reduce flow by between 0 and 150 cfs 72.6 percent of the time, and reduce flow by more than 150 cfs 21.4 percent of the time.

Puyallup River MIF Excursions. MIF excursion statistics for the Upper and Lower Bound diversion scenarios are very similar to the Baseline scenario discussed above (see Table 11). The seasonality of all three scenarios is also very similar.

Water Levels in the Lower Puyallup. On average, the WSP would reduce the stage in Puyallup River by 0.09 feet, or 1.08 inches for both the Upper and Lower Bound diversion scenarios, which was the same as the Baseline scenario. Under the Upper Bound diversion scenario increases in stage would occur 5.1 percent of the time, stage would decrease by between 0 and 0.2 feet during 85.9 percent of the time, and decreases greater than 0.2 feet would occur the remaining 9.0 percent of the time. Under the Lower Bound diversion scenario increases in stage would occur 4.0 percent of the time, stage would decrease by between 0 and 0.2 feet during 83.6 percent of the time, and decreases greater than 0.2 feet would occur the remaining 12.4 percent of the time.

Groundwater

The impacts of the WSP on groundwater are tied to the Lake Tapps water elevation. Lake Tapps water levels under the Upper and Lower Bound diversion scenarios are similar to those presented for the Baseline scenario, as presented in Table 13.

3.4.3 Water Quality

3.4.3.1. Existing Conditions

Water quality in the White and Lower Puyallup Rivers and Lake Tapps is generally good with some exceptions. Those exceptions include, historically, the reservation reach, where the White River has not met standards for temperature and pH, and the reach of the White River below the tailrace, where dissolved oxygen levels have sagged in the past.

However, since PSE curtailed diversions to Lake Tapps, water quality in all three water bodies has improved.

<u>Water Quality Standards</u>

Water quality standards are the criteria by which society determines if water is suitable for use. State standards apply throughout the watershed except on tribal lands. On the Puyallup River, the Puyallup Tribe's standards apply between RM 1 and 7.3. Currently, there are no U.S. Environmental Protection Agency (EPA)-approved water quality standards on the White River within the Muckleshoot Indian Tribe's reservation, although state standards apply above and below the reservation.

Under both state and tribal standards, freshwater criteria apply throughout the watershed, except below RM 3, where marine criteria apply at certain salinities. Where salinity exceeds 1 part per thousand (ppt), the marine dissolved oxygen criterion applies. Where salinity exceeds 10 ppt, the marine fecal coliform bacteria criterion applies.[3] State and Puyallup Tribe water quality criteria are presently identical for dissolved oxygen (DO), pH, temperature and fecal coliforms (Table 14).

Table 14 - State and Puyallup Tribe Water Quality Criteria

Parameter	Class A / B Freshwater	Class A/ B Marine Waters
Temperature (maximum)	18 °C / 21 °C	16°C / 19°C
Dissolved Oxygen (minimum)	8 mg/L / 6.5 mg/L	6 mg/L / 5 mg/L
pH	$6.5 \geq pH \leq 8.5$	$7 \geq pH \leq 8.5$
Fecal Coliform (Geometric mean: 90^{th} percentile)	100 : 200 / 200 : 400	14 : 43 / 100 : 200

Both the State and the Puyallup Tribe are in the process of revising their respective water quality standards. In all likelihood, future standards will be more stringent than existing standards. EPA has recommended and Ecology has proposed changes to state standards on the White and Puyallup rivers that would lower the temperature standard to 13-16ºC, depending on the time of year, and raise the dissolved oxygen standard to 9.5 mg/L. The Puyallup Tribe of Indians has proposed temperature and dissolved standards that are more stringent than EPA's recommendations to the state.

<u>Water Quality Conditions</u>

In Ecology's Water Quality Assessment Report for 2002-/2004, Ecology listed the following water bodies downstream of the diversion as impaired:

- White River, for instream flow, temperature, pH, and fecal coliform;
- Puyallup River, for instream flow and mercury; and
- Lake Tapps, for invasive aquatic species. [4]

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[3] In the Puyallup River TMDL for BOD and Ammonia, Ecology located the 1 ppt line at RM 2.2, roughly at the I-5 bridge. The 10 ppt line lies somewhere between RM 2.2 and the mouth of the river.

[4] The listing as impaired is based upon a September 2000 survey of a boat launch area that found Eurasian milfoil.

Additionally, USGS monitoring in 2001 and 2002 showed that dissolved oxygen concentrations in the White River can fall to levels near the standard during hydropower operations. Low dissolved oxygen concentrations in the lower White River are problematic because in the mid-1990's Ecology set new limits for discharges to the White and Puyallup Rivers specifically to ensure that DO levels remained above standards (Pelletier 1993 and 1994). In response to data that Ecology collected on the Puyallup River in 2000, the agency announced that it would not allow planned increases in discharge limits that municipalities will eventually need to serve growth (Ecology 2000). The USGS later showed that Ecology's 2000 data was in error, but Ecology has maintained the moratorium on accessing reserve allocations based upon the USGS's data that show that the White River at times is barely meeting standards

White River Reservation Reach

Fecal coliform is probably the least problematic parameter. In monitoring at RM 8 in Auburn, there were no violations in the past three years, and only one violation in the past five years, in 2002 (Table 15). Occasional high levels of fecal coliform in the White River are probably related to non-point sources. Fecal coliform levels will likely go down in the future, as they have on the Puyallup River, in response to land conversions to residential uses, the movement of the industry to the east side of the state, and implementation of the State's Dairy Waste Management Act and Confined Animal Feeding Operation (CAFO) regulations and permits.

Table 15 - White River Fecal Coliform Monitoring

Water Year	Geometric Mean of Coliform Count (CFU / 100 mL)	Percentage of Samples > 200 CFU / 100mL
2001	13	8 %
2002	62	**17 %**
2003	8	0 %
2004	10	8 %
2005	12	8 %

Notes: The state standards for fecal coliforms are geometric mean less than 100 CFU/100mL and less than 10 percent of samples with concentrations greater than 200 CFU/100mL. Values that exceed these thresholds are marked in **bold**.

In the past, water temperature in the White River has regularly exceeded standards in summer months (Figure 12). These violations are due in part to conditions in the upper watershed, where several major tributaries, including the Greenwater and Clearwater Rivers, have also exceeded the standard. In 2003, in cooperation with the U.S. Forest Service, Ecology prepared a Total Maximum Daily Load study for temperature and sediment for the upper river, and the USFS is now implementing the recommendations from that study. It will likely be many years before forest conditions return to a state that allow standards to be met.

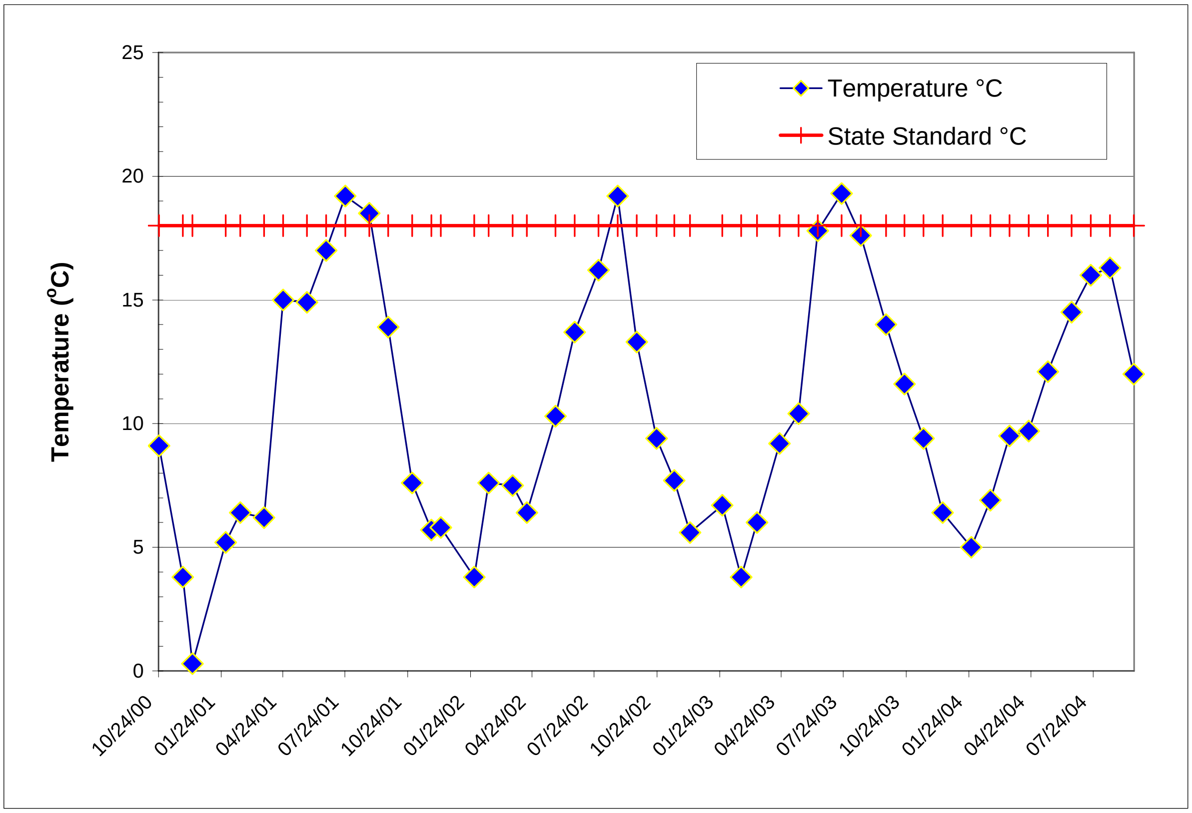

Figure 12 - White River Temperature, Water Years 2001-2005

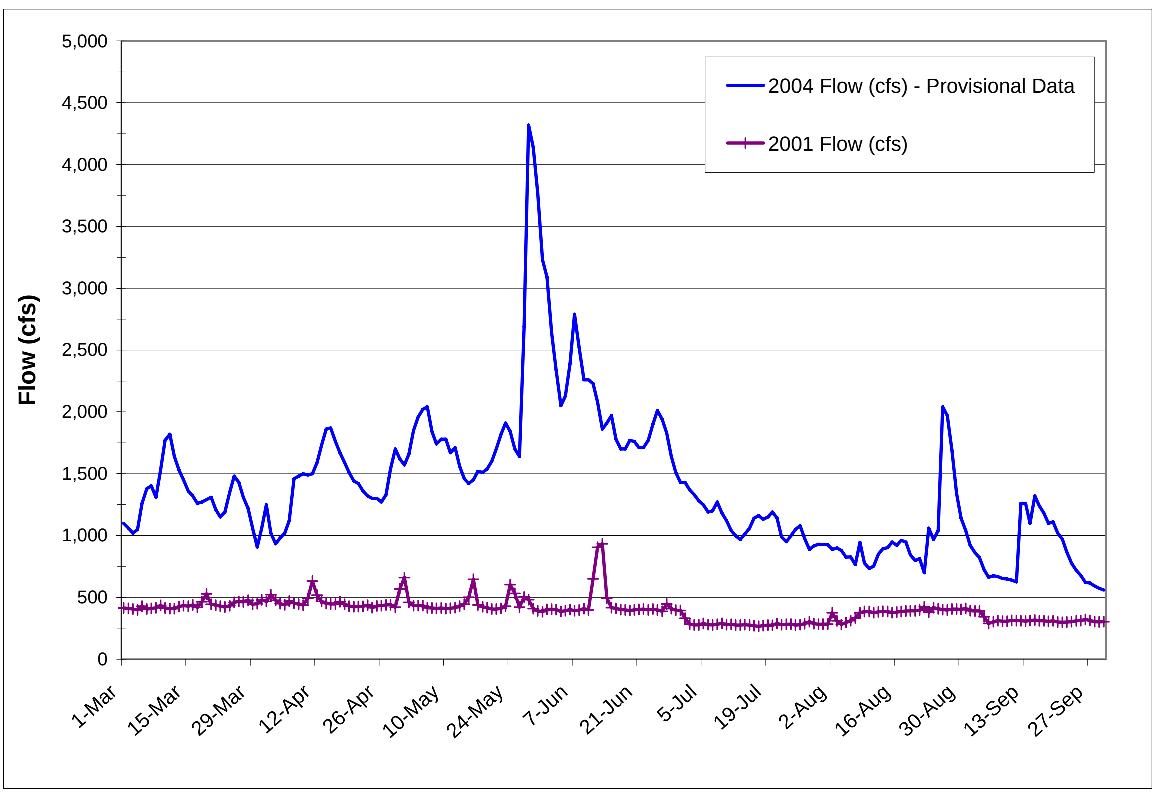

Figure 13 - White River Average Daily Flow at Auburn, Spring and Summer, 2001 and 2004 (RM 8.0)

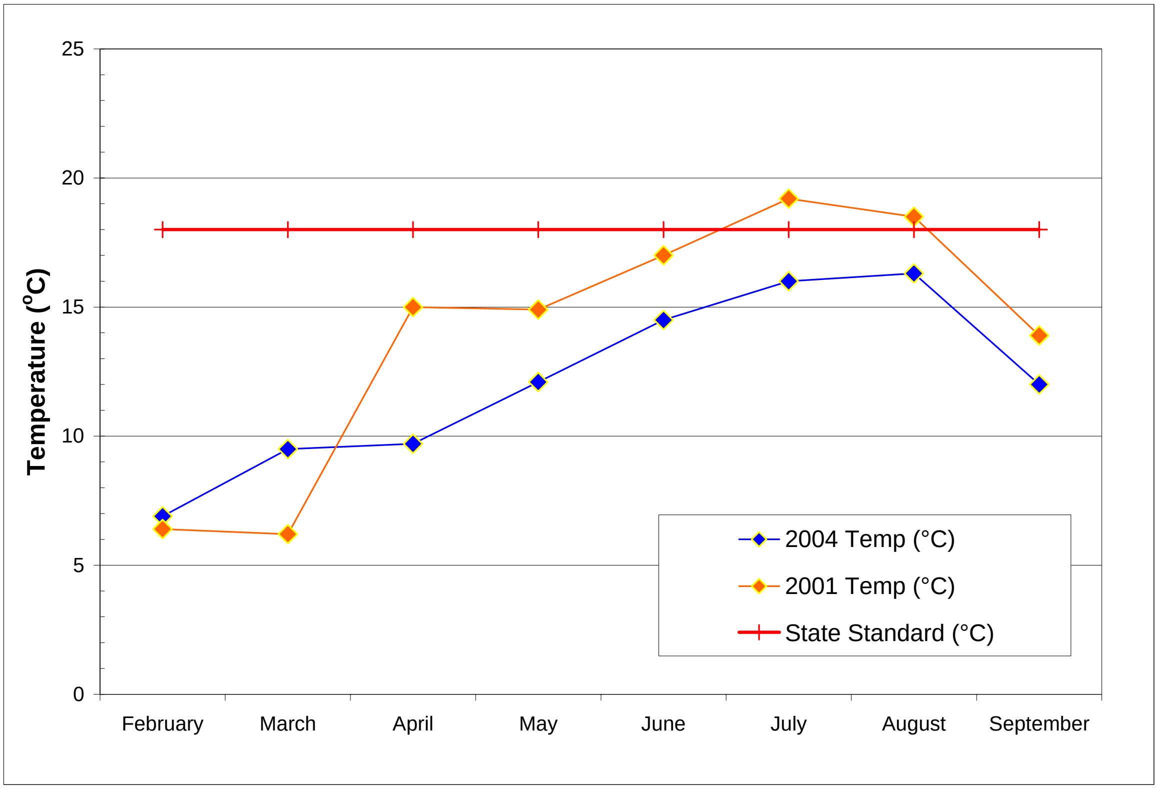

Figure 14 - White River Temperature at Auburn, Spring and Summer, 2001 and 2004, (RM 8.0)

Water diversions into Lake Tapps also affect temperature in the Reservation Reach. Diversions reduce the amount of water available to absorb heat that sunlight and warm air impart to the river, resulting in higher water temperatures. Data from 2001, when PSE was diverting water for hydropower production, and 2004, the first summer after PSE curtailed such diverions, show that diversions for hydropower can contribute to a change in temperature of several degrees in the Reservation Reach. In 2001, summer flows in the White River were in the range of 250 to 1000 cfs, the result of a dry water year and hydropower diversions. In 2004, with diversions for power generation halted, flows in the river were higher, in the range 500 to 4500 cfs (Figure 13). In 2004, with more water in the river, temperatures were 2-3°C (4-6 °F) lower than in 2001 (Figure 14). The decrease in water temperature occurred despite summer 2004 air temperatures in Washington State that were "much above normal…one of the 11 warmest periods on record." Had temperatures been similar between the two years, the decrease in water temperature in 2004 would have been greater.

pH violations occur primarily as a result of phosphorus-rich municipal wastewater dischargers from the towns of Enumclaw and Buckley immediately below the diversion and, to a lesser extent, non-point sources (Figure 15). Higher concentrations of phosphorus cause increased growth of algae on the river bottom, and algae consume dissolved carbon dioxide in river water for growth. Reduced levels of dissolved carbon dioxide, an acid in water, cause the pH to rise.

pH also changes with flow. This occurs because higher flows reduce, through dilution, the concentration of phosphorus in the river. pH in the Reservation Reach was lower in 2004 than in 2001 as a result of increased flows in the White River in 2004 after PSE stopped diverting water for power generation (Figure 16).

Ecology, the EPA, the Muckleshoot Indian Tribe and the Puyallup Tribe of Indians are together preparing a Total Maximum Daily Load Study for phosphorus on the White River. Ecology expects to require new controls on dischargers as a result of this study.[5]

Lake Tapps Reservoir

Lake Tapps is probably not impaired but some understanding of water quality in the lake is important for understanding water quality in the lower White River and the Puyallup River.

Like most lakes in North America, Lake Tapps stratifies in the summer, resulting in a warmer layer of water on top and a colder layer below. Stratification occurs because warm air and direct sun light heat the water on the lake surface. As the water on top warms, it becomes buoyant, and it tends to float on top of, rather than mix with, the underlying cold water. In the fall, air temperatures drop and the lake surface water cools down. Fall, winter, and spring winds are then able to keep lake water slowly mixed from top to bottom before the onset of stratification in the late spring.

In stratified lakes, the deeper cold water usually has lower levels of dissolved oxygen than the overlying warmer water. Lower DO occurs at depth because algae that live near the surface eventually die and sink to deeper water where they decompose - causing DO to drop. If a lake has an abundant source of light (from the sun – most lakes do) and nutrients in its surface layer, algae growth rates will be high. As a result, higher levels of nutrients and light lead to increased algae, which in turn lead to decreased DO in deep water.

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[5] The level and cost of phosphorus treatment depends directly on the minimum instream flow of the river. For the minimum instream flows recommended here, the additional treatment will consist of biological phosphorus removal, a process similar to, but more expensive than, the biological treatment systems the towns use now..

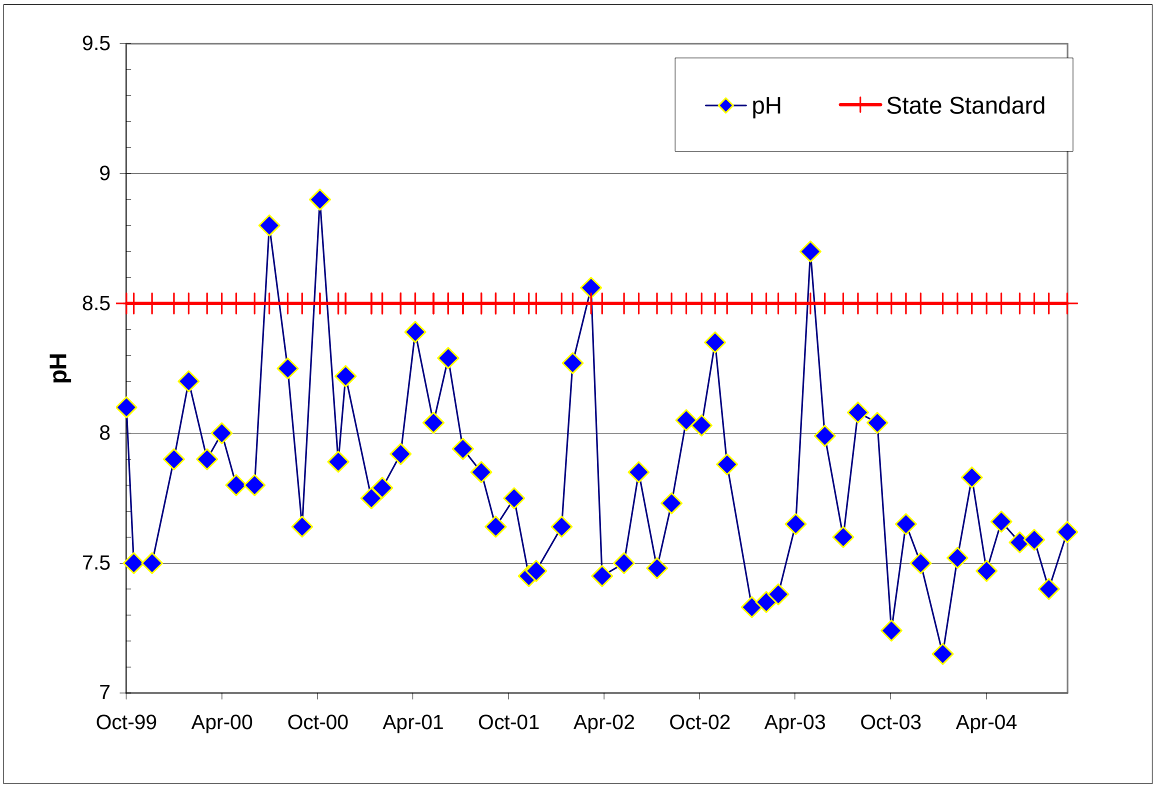

Figure 15 - White River pH, Water Years 2001 to 2004, (RM 8.0)

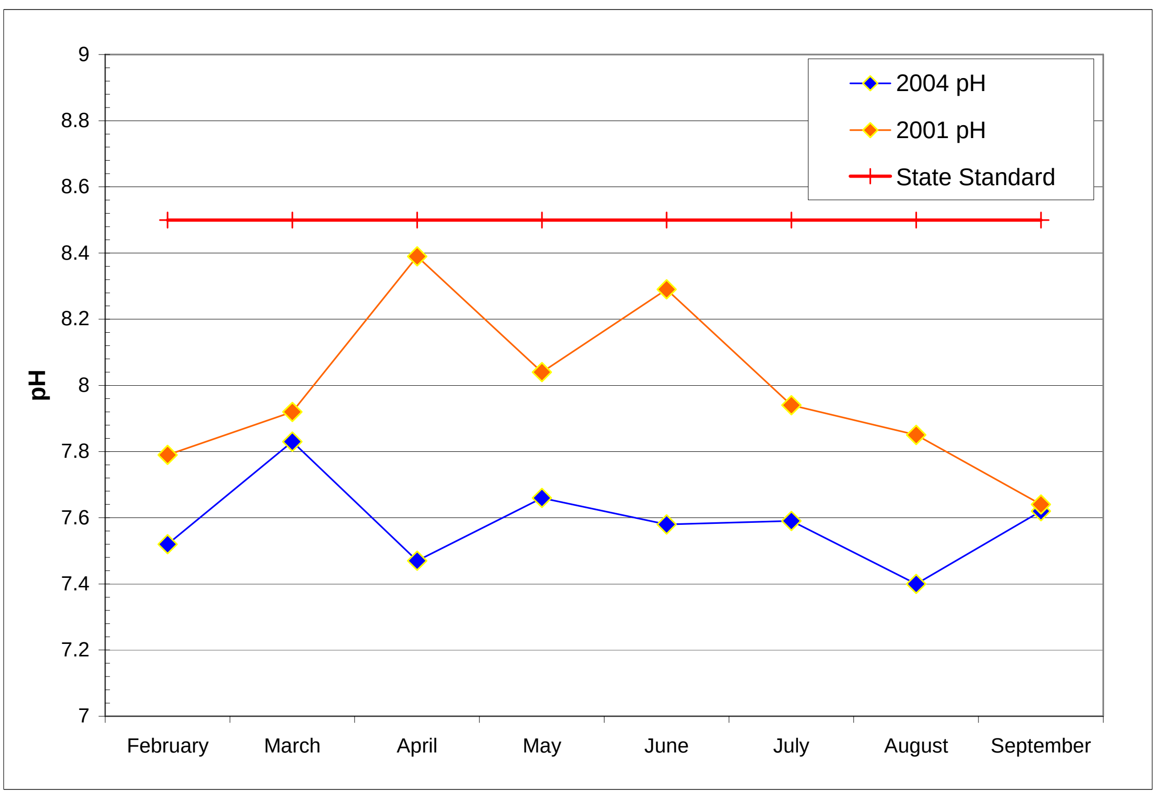

Figure 16 - White River pH at Auburn, Spring and Summer, 2001 and 2004, (RM 8.0)

What primarily determines the quality of water in a lake is the quality of its source water – in this case, the White River. Since the White River carries a large sediment load at times, water in Lake Tapps has been (historically) cloudy, creating a low light condition that is not favorable for algae growth. Phosphorus levels in the lake have probably varied historically with changing phosphorus levels in the river.

The *amount* of water moving through a lake ("Flushing Flow") also influences water quality in the lake. If a relatively *small* amount of water is entering a lake relative to its size, water will remain in the lake for a long time. In the summer, lake water would have time to warm up, and sediment – and sediment-bound pollutants like phosphorus – would have time to settle to the bottom. In contrast, if a relatively *large* amount of water is moving through a lake, there would be less time for water to warm up and for sediment to settle out. With respect to suspended sediment, a lake is in effect a large settling basin.

When PSE stopped diverting water for power generation in 2004, a number of parties noted that a change in flow through the lake could affect lake water quality. Some of the changes could make water quality better for recreational and aquatic life:

- A longer lake residence time would result in warmer water in the upper levels of the lake where most recreational activity occurs.
- A decrease in the amount of sediment delivered to the lake would result in clearer water, a more aesthetic condition for recreation.
- A decrease in the amount of phosphorus delivered to the lake by the river would result in a decrease of algae, clearer water, and higher levels of dissolved oxygen in the deeper lake waters.

But some changes could counterbalance the positive changes and make water quality worse:

- A warmer surface layer would result in lower dissolved oxygen at the surface, as warmer water holds less dissolved oxygen than cold water.
- A decrease in the amount of suspended sediment in the lake would increase light at the lake, bringing increased algae and aquatic plant growth.
- Less dilution of any phosphorus that enters the lake from lake-side sources would cause increased algae levels, more turbid water, and lower levels of dissolved oxygen in the deeper lake waters.

Both Ecology and Pierce County sampled Lake Tapps in 2004 and 2005 to characterize water quality. The following conclusions can be drawn from the data:

1) Temperatures were higher near the surface of the lake in 2004 relative to earlier years, reflecting increased residence time (Figure 17).[6]
2) The lake was clearer than in earlier years. This is the combined effect of a decrease in the sediment loading and an increase in residence time (allowing for more settling - Figure 18).
3) Algal levels in the lake were low. Average chlorophyll-A was below EPA's reference condition of 3.5 µg/L in six of nine stations (Table 16).
4) Algal levels in the lake were low because phosphorus levels were low. In Lake Tapps, six of nine stations were below the state's action level of 20 µg/L (Table 16). The two stations

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[6] The 1997 data is Ecology data. Ecology collected a small amount of data on Lake Tapps between 1997 and 2000 under Ecology's Volunteer Lakes Monitoring Program. The data are primarily secchi disc depth (a measure of water clarity, measured as the depth to which an observer can see a dinner-plate sized disc lowered on a rope into the lake) and depth profiles of temperature and dissolved oxygen.

where phosphorus levels were highest were located near the point where the canal flows into the lake and are not representative of lake conditions.

In summary, lake water quality was good in 2004 and 2005 despite, or perhaps because of, the decrease in diversions those years.

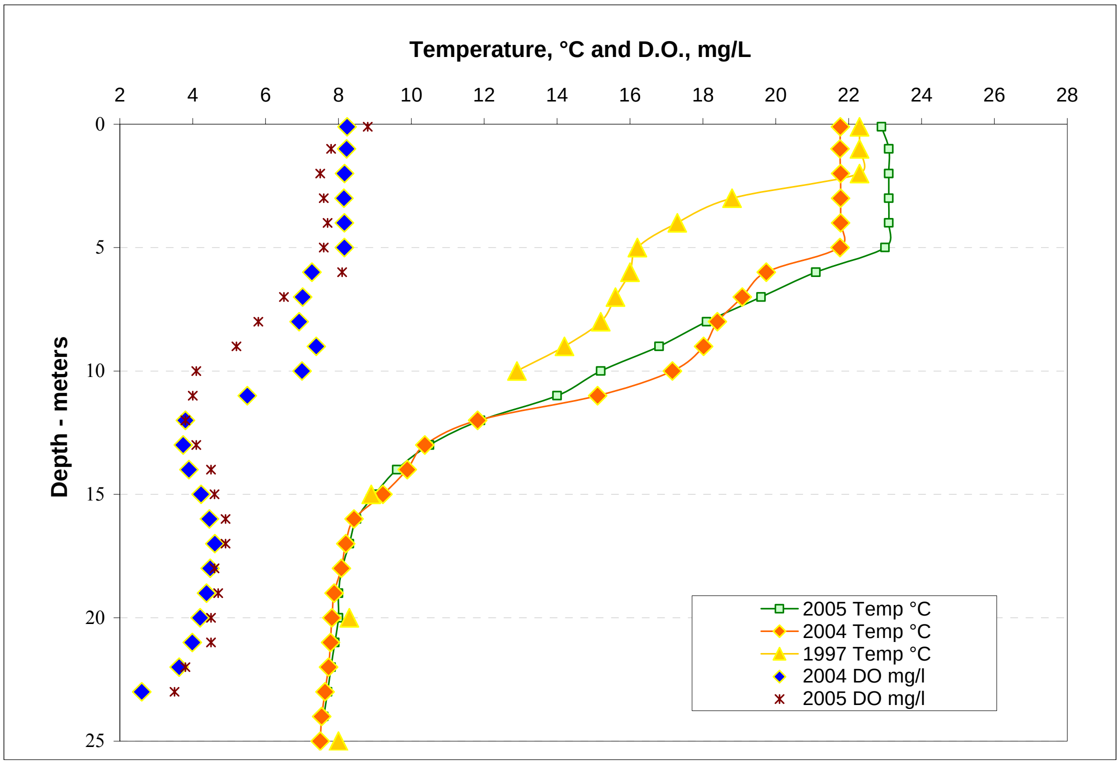

Figure 17 - Lake Tapps Temperature and Dissolved Oxygen Profiles, August 1997, 2004 and 2005

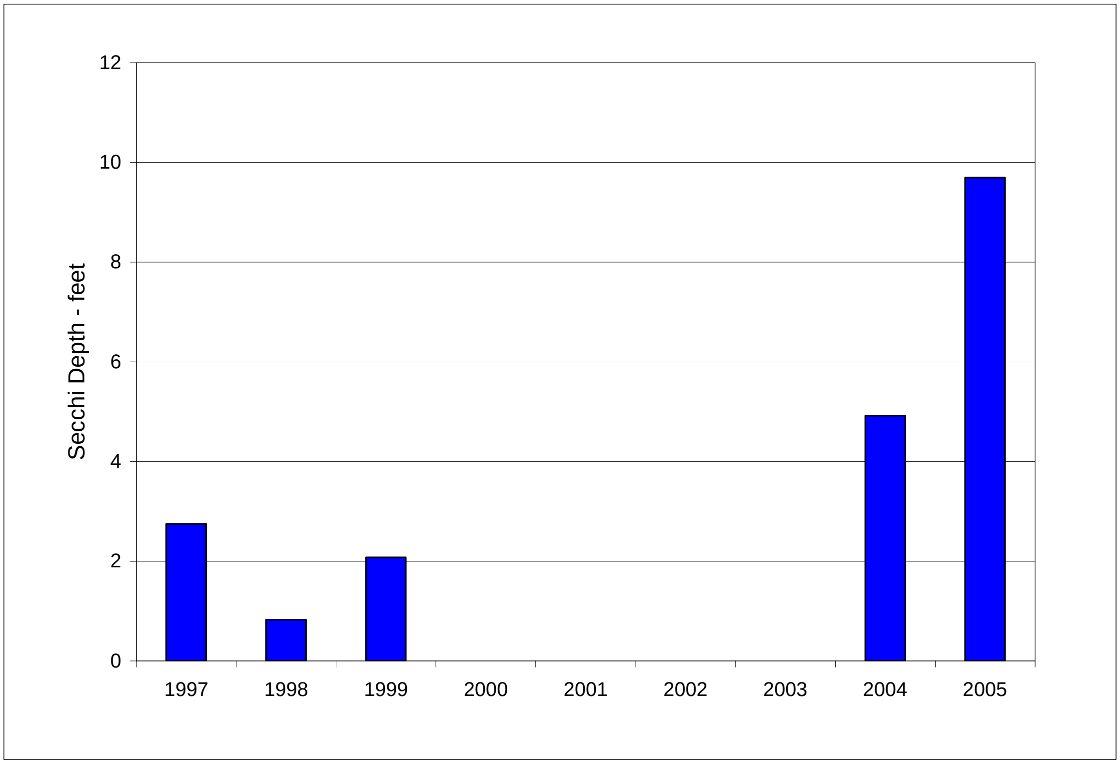

Figure 18 - Lake Tapps Secchi Depth 1997-1999, 2004, 2005 (August)

Table 16 - Summary of Lake Tapps Epilimnetic Water Quality Data

Station	Average Total Phosphorus in µg/L		Average Chlorophyll-A in µg/L	
	Aug - Nov 2004	Mar - Aug 2005	Aug - Nov 2004	Mar - Aug 2005
1	**49**	**28**	1.8	2.2
2	**42**	**21**	2.2	3.5
3	14	10	1.7	2.1
4	10	12	1.9	3.5
5	9	14	2.6	**4.2**
6	8	12	1.7	3.3
7	**22**	18	**5.7**	**3.9**
8	11	15	2.1	2.7
9	8	11	1.7	**4.3**

Note: The state action level for total phosphorus is 20 µg/L. The EPA reference condition for Chlorophyll-A is 3.5 µg/L. Values that exceed these thresholds are marked in **bold**.

Lower White River

Water quality in the lower White River is dependent on the amount and quality of water coming from the upstream White River and that coming from Lake Tapps. For example, during hydropower operations in 2001, flows in the Reservation Reach were relatively *low* (see Figure 13), while discharges from Lake Tapps were relatively *high* (Figure 19). As a result, 2001 flows in the lower river primarily consisted of discharges from Lake Tapps, and lake water quality strongly influenced lower river water quality.

In contrast, in 2004, absent hydropower operations, flows in the Reservation Reach were relatively *high*, while discharges from Lake Tapps were relatively *low*. As a result, 2004 flows in the lower river primarily consisted of water from the upstream White River.

During August through October 2001, when PSE was diverting water for hydropower, HDR (PSE's consultant) collected continuous water quality monitoring data from the Lake Tapps tailrace and from the White River at RM 4.9 (above the tailrace). At the same time, the USGS collected data from the White River at RM 1.8 (below the tailrace), and from the Puyallup River at RM 2.9 and 5.8. The USGS and HDR recorded dissolved oxygen, temperature, pH, and specific conductance continuously, resulting in a record of the variation of these parameters throughout the day.

Dissolved oxygen, temperature, and pH were in violation of state water quality standards on one or more occasions during the monitoring period. Dissolved oxygen was below the standard of 8 mg/L on two occasions in the White River at RM 1.8. Temperature violations occurred in the White River at locations upstream (RM 4.9) and downstream (RM 1.8) of the tailrace. pH was above the standard (8.5) in the White River at RM 4.9 (above the tailrace). Monitoring results are described more completely in TM 19 and Ebbert (2002).

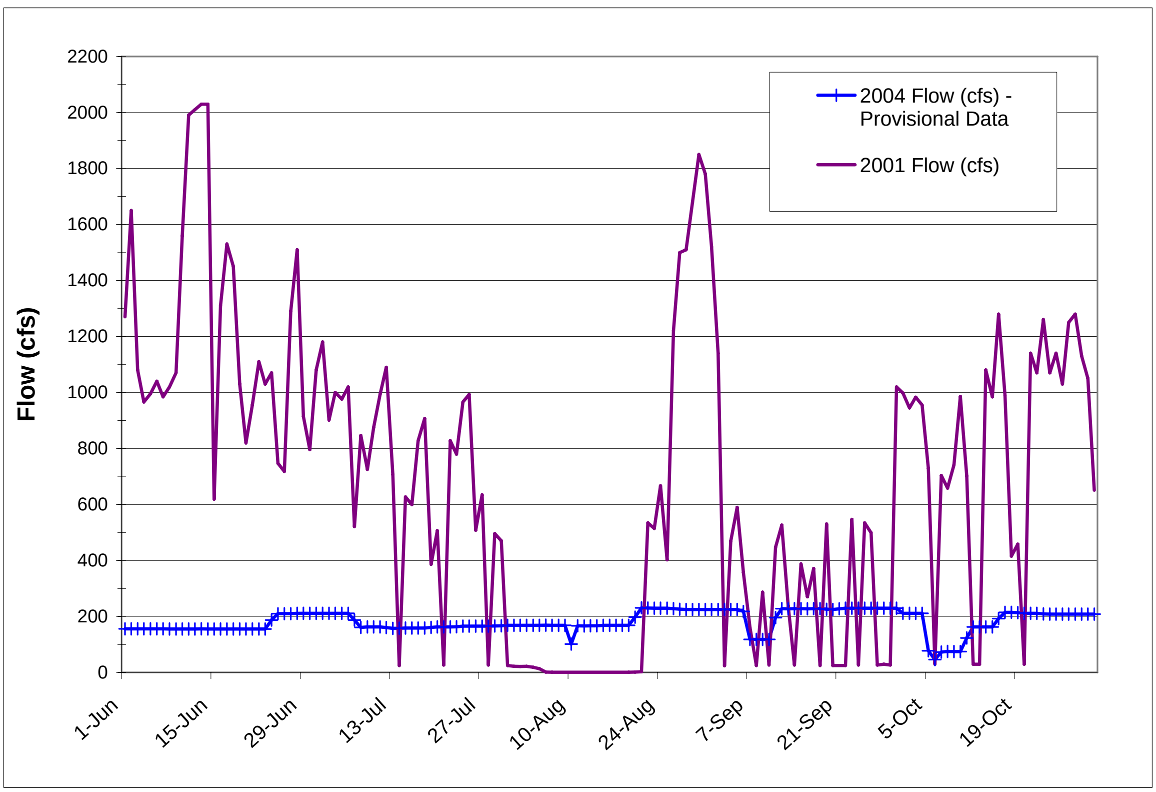

Figure 19 - Lake Tapps Tailrace Average Daily Flow, Summer 2001 and 2004

Historically, when PSE was operating Lake Tapps for hydropower production, water in the Lake Tapps tailrace had higher temperatures, lower DO, and a lower pH than the White River above the tailrace. The differences between Lake Tapps and the White River for specific parameters varied considerably in the 2001 monitoring, with the average temperature of tailrace releases 1.7 °C higher, average DO was 0.7 mg/L lower, and average pH was 0.62 units higher than the White River upstream of the tailrace at RM 4.9.

Comparing temperatures in 2001 (hydropower diversions) and 2004 (no hydropower diversions) it is not readily apparently that hydropower affected temperature in the lower river (Figure 20). However, the additional flow in the river in 2004 probably did have an effect on temperature. Without higher flows, river water temperature would have been higher given the very warm summer air temperatures in 2004.

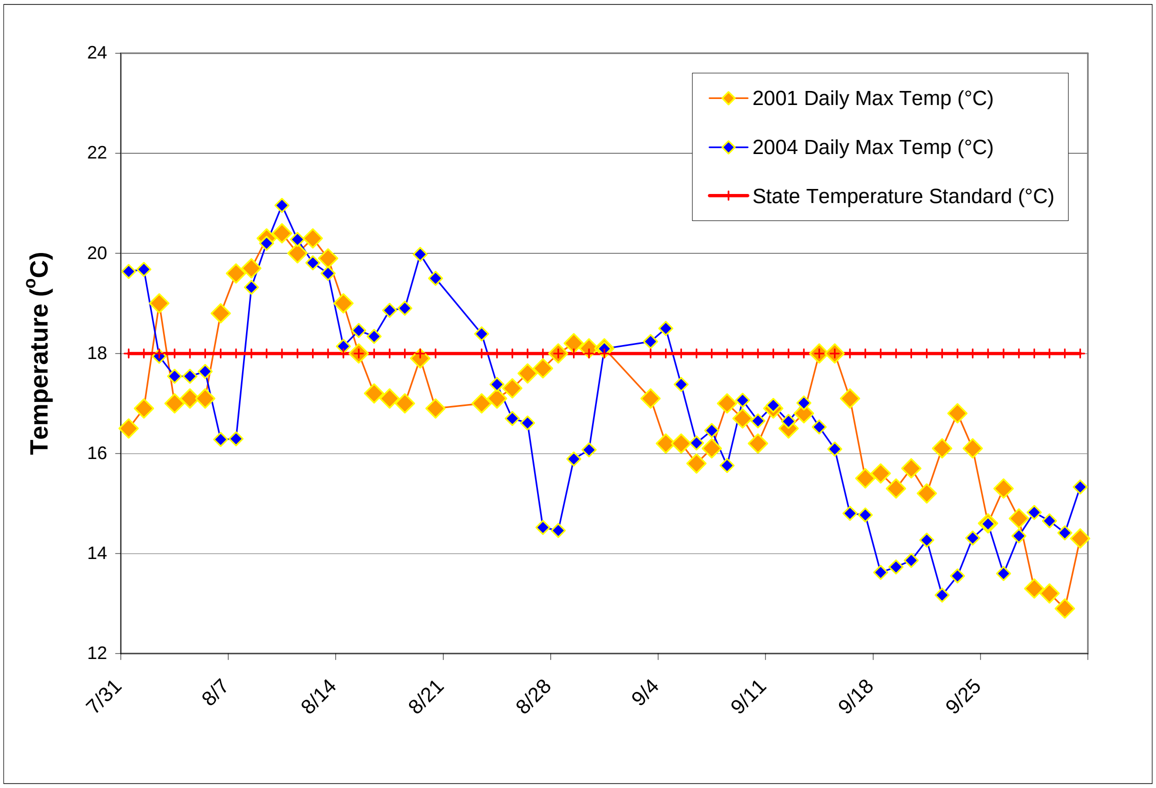

Figure 20 - White River Daily Maximum Temperature, 2001 and 2004, (RM 1.8)

After reviewing the 2001 data, Ecology modeled the effects of the tailrace discharge on dissolved oxygen in the White and Puyallup Rivers. The model runs examined several scenarios based on the observed 2001 tailrace flow and water quality data, and compared results from these model runs to the May-October 7Q10 model run that was the basis of the TMDL allocations (Table 17). All of the model runs assume historic low-flow conditions in the river system – 132 cfs in the Reservation Reach, and 335 cfs in the Puyallup at the confluence.

Table 17- Lower White River Dissolved Oxygen Model Input Data

Scenario Name	Tailrace Discharge in cfs	Tailrace DO in mg/L
May-Oct	300	8.0
2000-78	2000	7.8
1500-76	1500	7.6
1000-72	1000	7.2
500-72	500	7.2
178-62	178	6.2

The model predicts that discharges from Lake Tapps during hydropower generation in low flow conditions would reduce dissolved oxygen in the lower White River by roughly 2 mg/L (Figure 21). Below the tailrace, the model predicts that DO would be in the range of 7.5-8 mg/L (below the standard), and about 1 mg/L lower than predicted in the TMDL analysis. Upstream of the tailrace, the model predicts that DO in the White River will be roughly 9.7 mg/L (almost 2 mg/L above the standard).

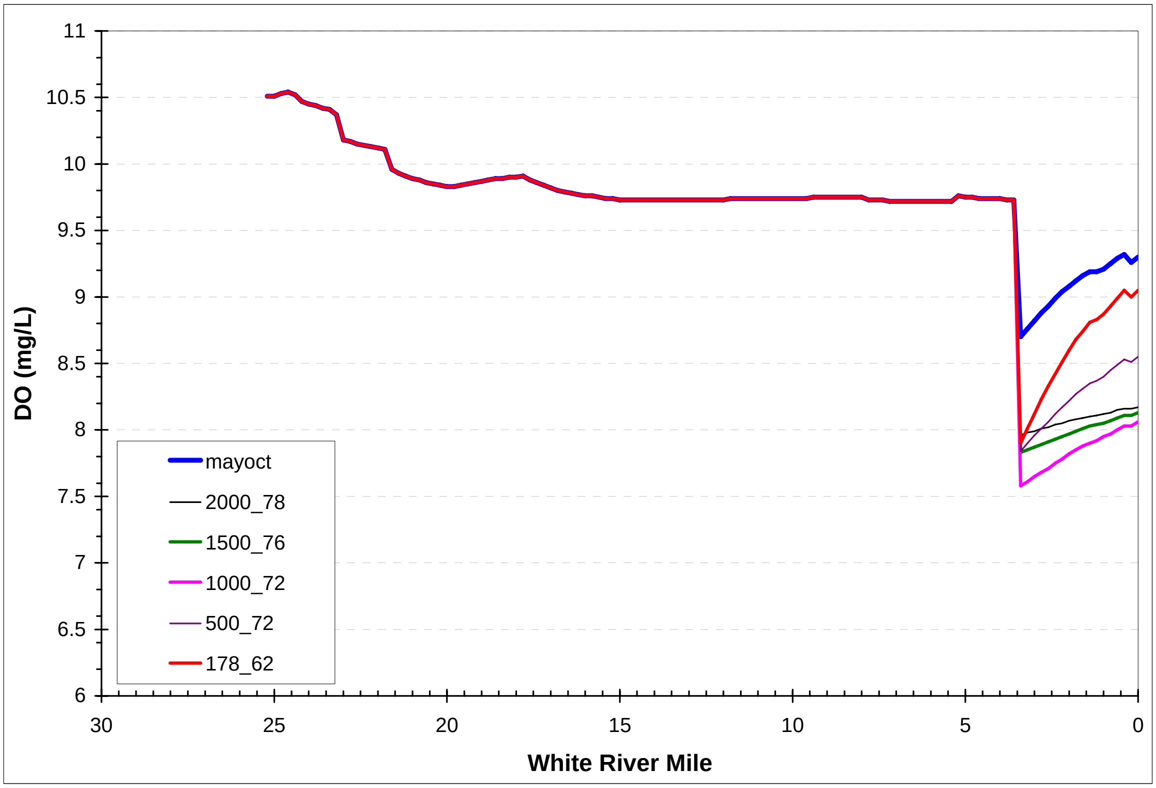

Figure 21 - Model-Predicted Dissolved Oxygen in the White River during Critical Conditions

<u>Lower Puyallup River</u>

The Puyallup River below the confluence generally meets water quality standards. Summer temperatures in 2001, when PSE was generating hydropower, met standards and were similar to temperature in 2004, when they were not generating power (Figure 22). The additional flow in the White River in 2004 probably helped keep Puyallup River temperatures down despite the heat of that summer. Dissolved oxygen levels also met standards both years (Figure 23).

Although the Puyallup River meets water quality standards, it is likely affected by the discharges from Lake Tapps. Ecology's TMDL model runs predict that at the confluence, Puyallup River dissolved oxygen drops about 1 mg/L from near 11 mg/L to near 10 mg/L (Figure 24). The decrease is the result of the Puyallup River's merger with the White River that contains the Lake Tapps outflows. When the TMDL model was run using 2001 data, DO levels fell further, to the range of 8.5 to 9.5 mg/L. The model-predicted decrease near RM 2.0 (Figure 24) results from mixing of river water with naturally-occurring, lower-DO saltwater in Commencement Bay that intrudes into the river estuary at high tide.

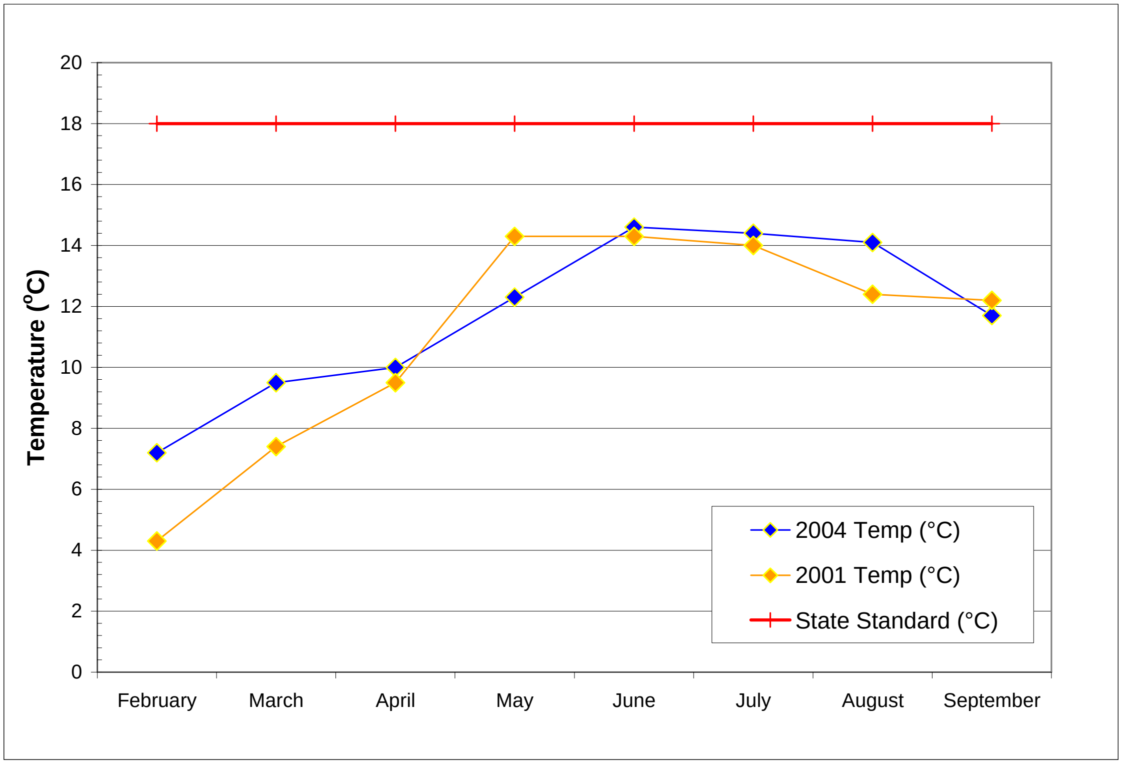

Figure 22 - Puyallup River Temperature, 2001 and 2004

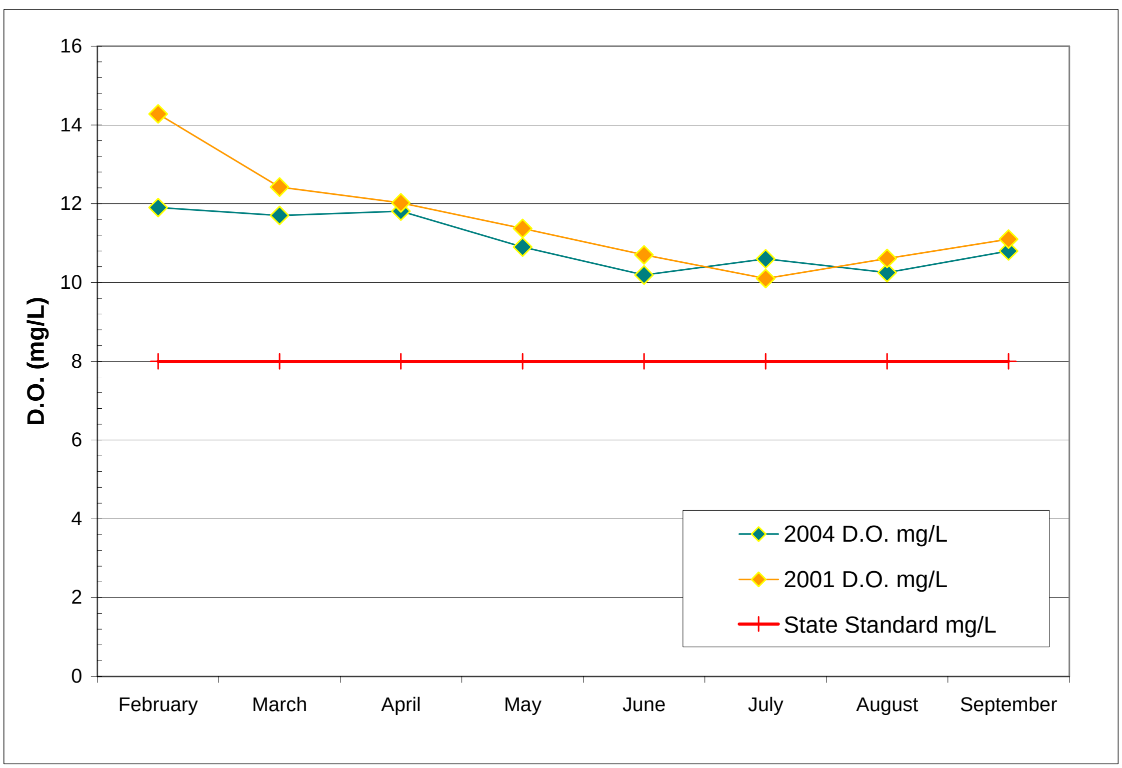

Figure 23 - Puyallup River Dissolved Oxygen, 2001 and 2004

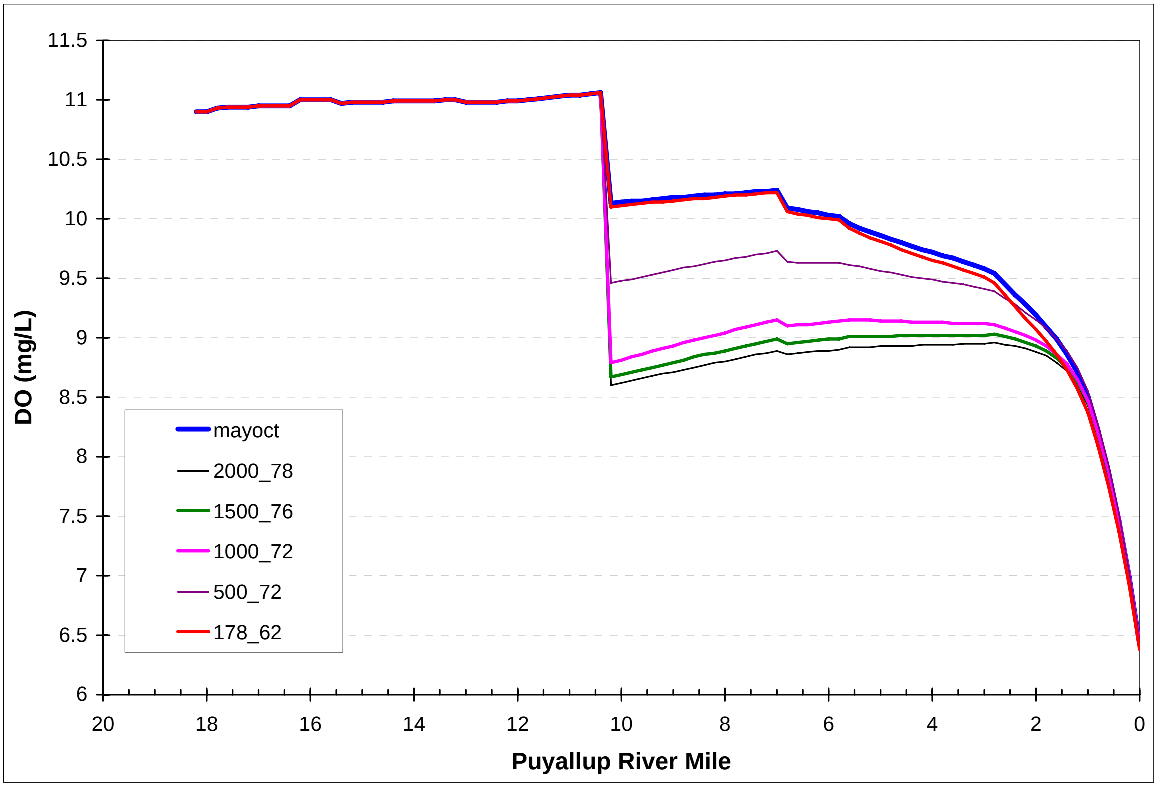

Figure 24 - Model-Predicted Dissolved Oxygen in the Puyallup River during Critical Conditions

3.4.3.2 Methodology

Beginning in January 2004, PSE reduced diversions to Lake Tapps and as a result lake and river water quality changed, generally for the better.

When the WSP comes on line, new instream flow requirements will again increase flows in the White River, and again reduce flows through Lake Tapps, although the change in flows will be much smaller than in 2004. Water quality should remain good in the lake and improve in the river. In the lake, low phosphorus levels should continue to restrict algae growth despite longer water residence times that promote that growth. In the river, increased flow will result in cooler water temperatures when flows are lowest in the late summer.

To assess changes in water quality, we examined the Baseline and Upper and Lower Bound Diversion scenarios for the water quality parameters of primary interest (see Section 3.4.3.1). In the lake, nuisance algae are the primary (potential) water quality concern. In the river, temperature is the primary concern. For each of the three scenarios, we used the hydrologic model to predict flow through the lake and in the river during the 1991-2002 water years and used the resulting predicted flows to assess changes in water quality as described in the following sections.

<u>Lake Tapps Reservoir Water Quality</u>

To evaluate lake water quality, we used the model-predicted flows from the tailrace to calculate flushing rates and residence times during the summer. The predicted residence times were compared with the residence time that is necessary to control algae through flushing, about 1 month. We also reviewed annual flushing rates.

To calculate the percent of the lake that flushes we used monthly theoretical residence times (θ) calculated as the lake volume (V) divided by the flow-rate through the lake (Q), $\theta = V/Q$. This calculation provides an estimate of the theoretical flushing rate, or the upper bound on flushing.

The goal of "flushing" a lake (diverting more water through a lake to reduce the hydraulic residence time) is to move algae through the lake fast enough that population levels don't have time to increase to nuisance levels.[7] In effect, water moving through a lake is like a conveyor belt carrying a growing algae population. If the belt moves fast enough, algae do not have time to grow to nuisance levels before reaching the lake exit.

For Lake Tapps, with or without the WSP, flushing rates are low, residence times are high, and algae have time to grow to nuisance levels. The reason they do not is that there is not enough phosphorus in the lake to support their growth. PSE's existing lake operations such as the annual drawdown of lake levels and the use of settling basins in the diversion canal, are important factors in keeping phosphorus levels low. The settling basins remove a high percentage of the phosphorus that enters the diversion canal from the river.

When water supply operations commence, phosphorus loadings to the lake will decrease. The reduction will occur because a) lower diversion rates result in a lower total phosphorus load diverted out of the river and b) lower diversion rates improve the removal efficiency of the settling basins. Hence, a 50 percent reduction in diversions should reduce phosphorus loadings to the lake from the river by more than half.

Finally, although lake flows are not currently enough to "flush" the lake in the summer, lake level drawdown in the fall and winter flows together are sufficient to do so annually. Winter drawdown results in water moving out of the side-basins and into the central basin where the water can be eventually pushed out of the lake by inflowing water.

<u>White and Puyallup River Water Quality</u>
To evaluate the potential effects of the WSP on water quality in the Reservoir Reach of the White River, we used the flows predicted by the water quantity model to calculate changes in temperature at White River RM 15.5 and RM 4.9 using a flow/temperature regression analysis developed by the Muckleshoot Indian Tribe.

3.4.3.3 Potential Effects of the WSP

<u>Baseline Scenario</u>

<u>White River Reservation Reach</u>
Under the Baseline scenario, water supply operations would primarily either increase or not change summer flow in the White River. About 40 percent of the time there would be little change in summer flow in the river - that is, the change would be no more than plus or minus 5 cfs (Figure 25), or 1 percent of the flow in the river (Figure 26). Another 40 percent of the time, flows would increase in the river. About 20 percent of the time, summer flow would decrease.[8] It is important to note that decreases in flow in the White and Puyallup Rivers only occur when MIFs are met.

There is a difference in the magnitude of flow increases and flow decreases. The increased flows are comparatively large; more than one-half are greater than 100 cfs. In contrast, the decreased flows are relatively small; only about one-quarter are greater than 100 cfs..

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[7] Another "flushing" concept is to bring in a higher quality source of water to dilute or displace lower quality lake water. In this case, there is no alternative water source and lake water quality is already good.

[8] Figures 25 and 26 were modeled using data from 1991- 2002

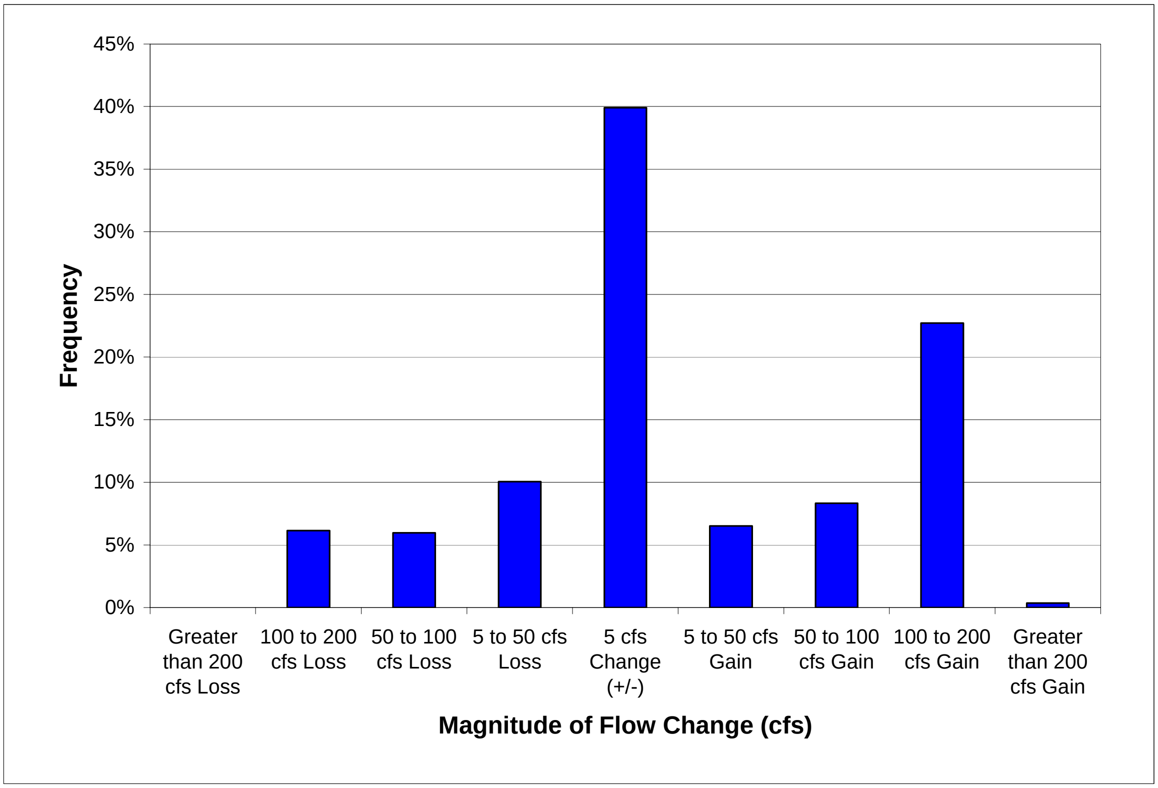


Figure 25 - Change in Summer Flow in the Reservation Reach of the White River – Baseline Scenario

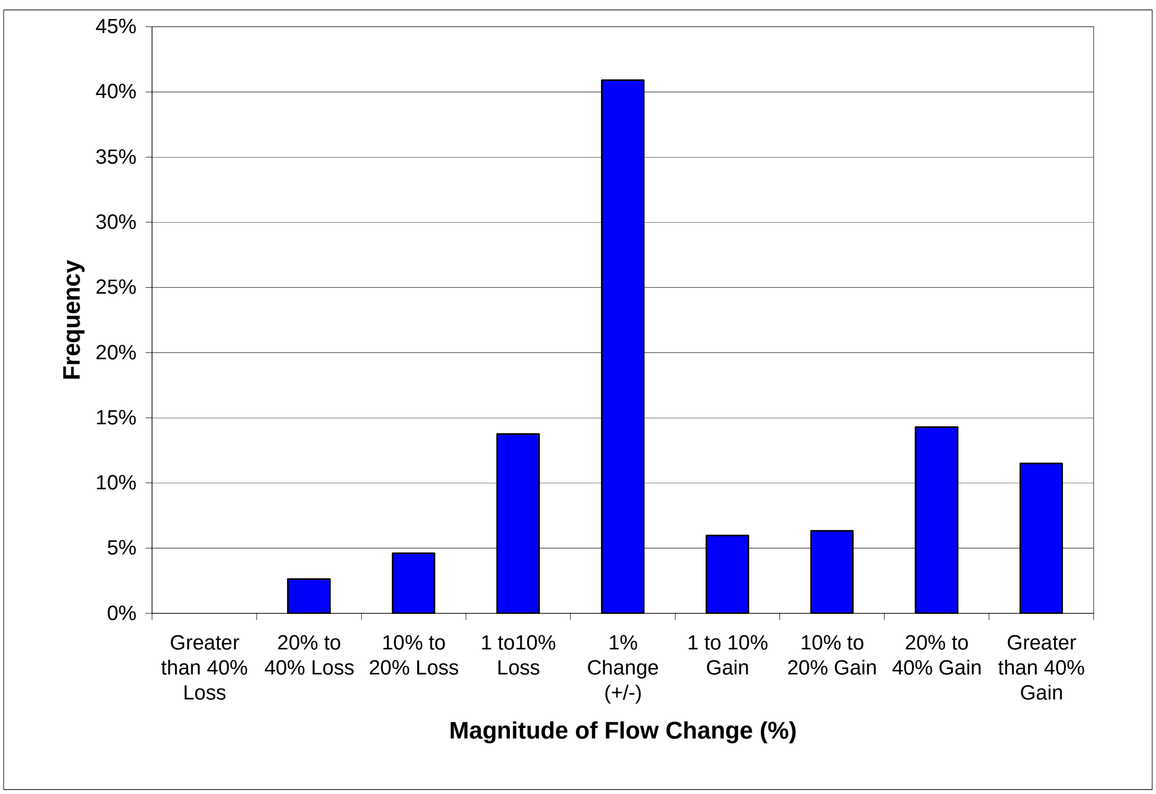


Figure 26 - Percent Change in Summer Flow in the Reservation Reach of the White River – Baseline Scenario

Changes in summer water quality track changes in flow. At RM 15.5 the highest temperatures would be reduced from a range of 17-18°C, to a range of 16-17°C (Figure 27).[9] Forty percent of the time, water quality in the river would improve – temperatures would drop slightly. Another 40 percent of the time, there would be little change in temperature – corresponding to the 40 percent of the time that there is little change in flow (Figure 28 and Figure 29). And about 20 percent of the time, water quality in the river would be adversely affected under this scenario.

As with flow changes, there is a difference in magnitude in water quality improvements. More than one-half of the decreases in temperature are between 0.3 and 0.5°C, while only about one-tenth of the temperature increases are in that range. Temperatures do not exceed the state standard (18°C) at RM 15.5 (18°C), but do exceed the standard at RM 4.9.

With respect to DO, Ecology set current discharge limits in the Puyallup River basin to achieve the dissolved oxygen standard of 8 mg/L using a minimum instream flow of roughly 130 cfs in the White River. Higher minimum instream flows as a part of the WSP would raise DO levels in the White River such that DO levels will remain substantially above 8 mg/L above the tailrace under all scenarios.

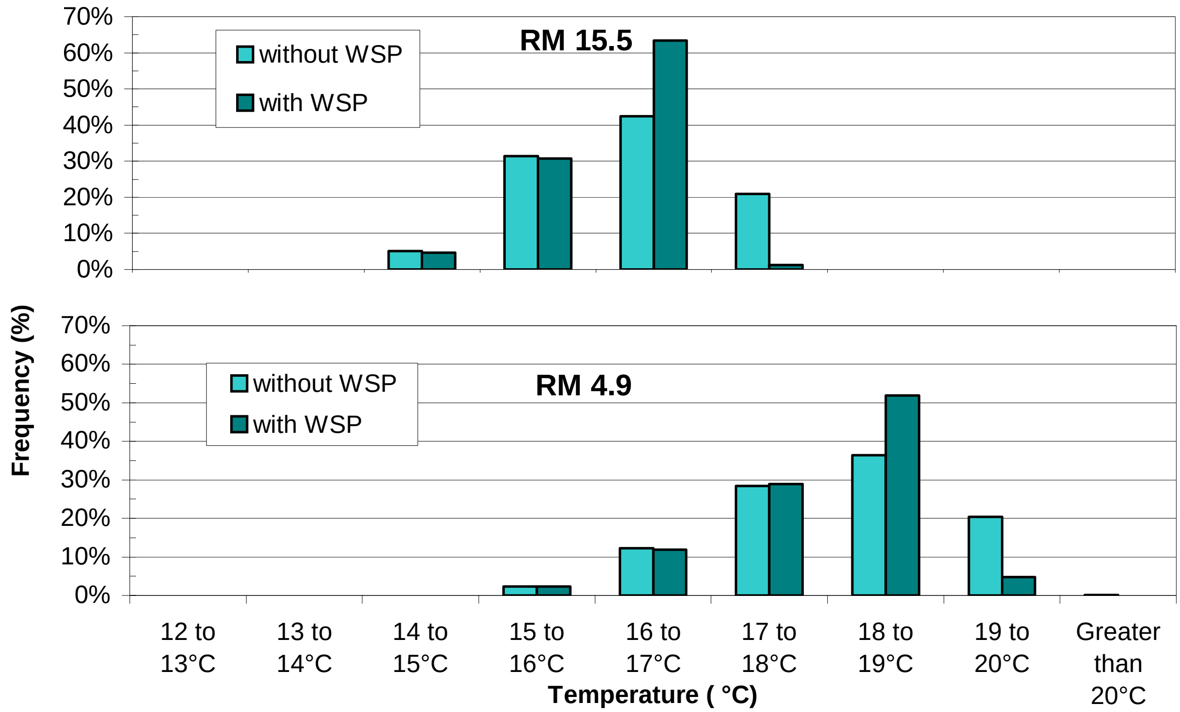


Figure 27 - Summer Temperature at White River RM 15.5 and RM 4.9, with and without WSP

[9] All temperatures reported in the text and figures are daily maximum temperatures.

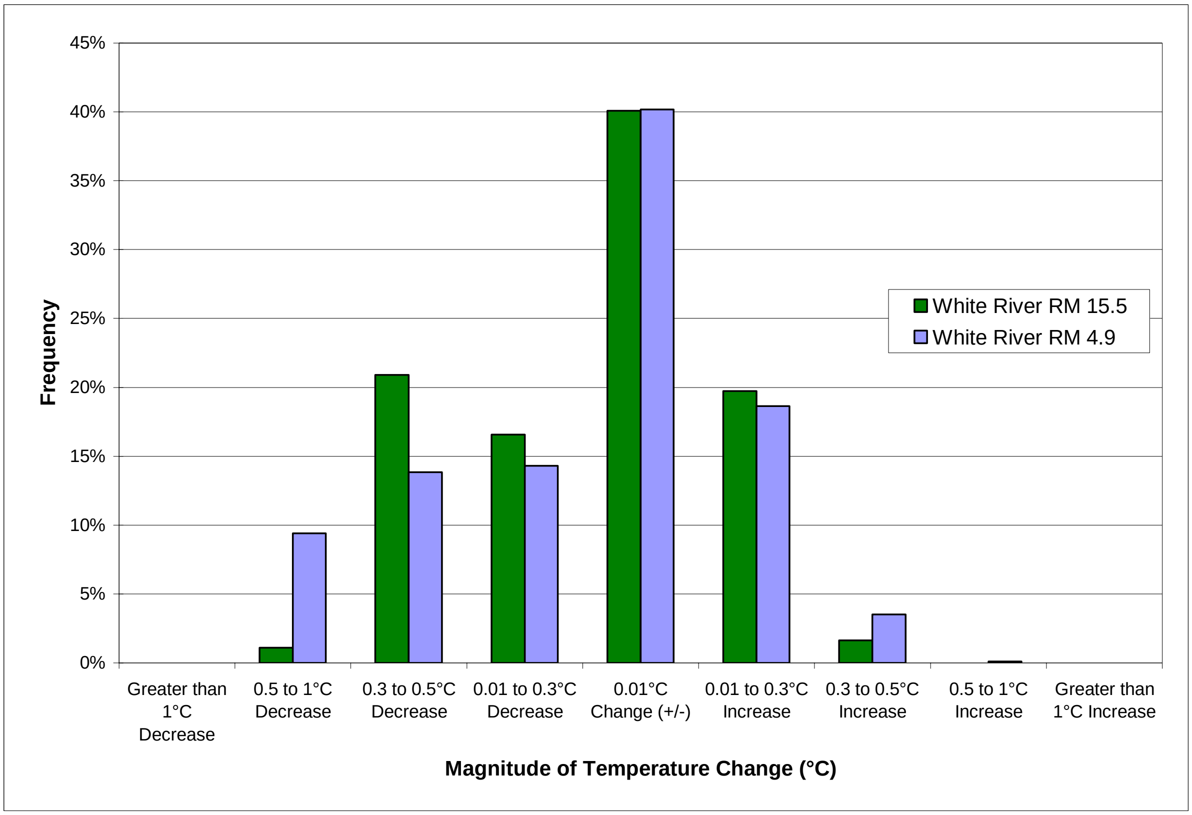


Figure 28 - Change in Summer Temperature at White River RM 15.5 and RM 4.9 – Baseline Scenario

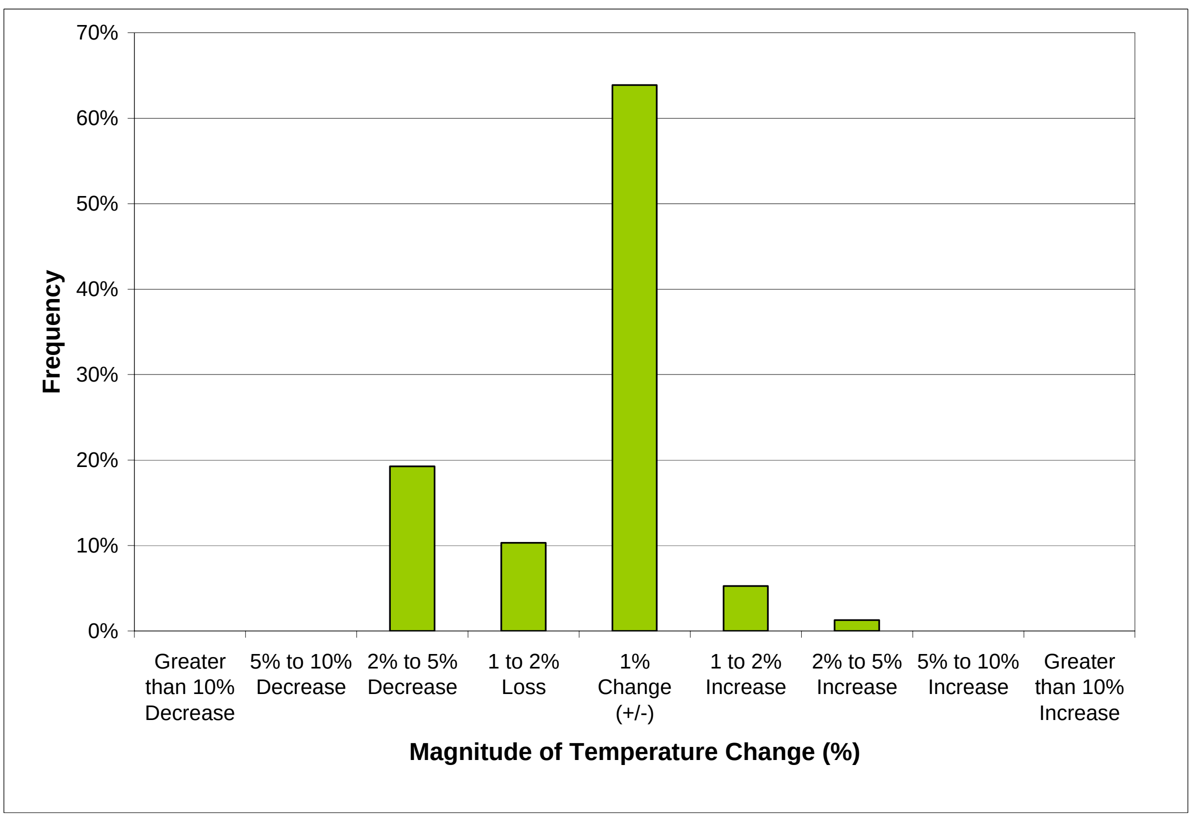


Figure 29 - Percent Change in Temperature in the White River RM 15.5 – Baseline Scenario

Lake Tapps Reservoir

Without the WSP, up to 55 percent of the lake's water would be replaced by fresh inflow each summer, on average (Table 18). With only about 18 percent of the lake replaced by fresh water each month during summer, water in the lake would have a residence time of several months. With the WSP, about 60 percent of the lake's water or less would be replaced by fresh inflow every summer – about 20 percent each summer month, on average.

Table 18 - Maximum Possible Lake Flushing with and without the WSP

	Summer Lake Flushing (%)		Annual Lake Flushing (%)	
Scenario	without WSP	with WSP	without WSP	with WSP
Baseline	55	60	430	425
Lower Bound Diversion	10	55	320	375
Upper Bound Diversion	105	90	940	865

The small increase in flushing likely would have little effect on nuisance algae growth. To control nuisance algae through flushing, residence time in the summer would need to be about a month; that is, the lake would have to be entirely (100 percent) flushed every month, or 3 times (300 percent) over the summer.

With or without the WSP, there would not be enough water flowing through the lake to control nuisance algae. In practice, very few lakes have sufficient flow to control algae through flushing – the amount of water required is too great. As a result, Lake Tapps managers will likely control algae the way lake managers control algae at most if not nearly all other lakes - by controlling phosphorus loadings.

Lower White River

Water quality in the Lower White River is dependent on the amount and quality of water coming from the White River Reservation Reach and tailrace discharges from Lake Tapps. Tailrace discharges typically represent a small percentage of total White River flow. Therefore, water quality in the Lower White River is controlled primarily by water quality in the Reservation Reach. Water quality impacts of the WSP on the Reservation Reach are discussed above. Impacts of the WSP on the Lower White River are discussed in terms of tailrace discharges.

Data collected in 2001 under hydropower operations indicate that tailrace discharges typically have higher temperature and lower dissolved oxygen values than the White River (Section 3.4.3.1). Temperature data collected after hydropower operations ceased in 2004 were similar to that collected in 2001 suggesting that tailrace water quality may not vary much based on operations. Therefore, tailrace water quality under post-hydropower operations is likely similar to that measured in 2001.

Based on the assumption that tailrace discharges may contribute higher temperature and lower dissolved oxygen water to the Lower White River, the WSP will improve water quality over the baseline condition by limiting tailrace discharge to the river. Figure 30 shows the simulated magnitude of change in tailrace discharge due to the WSP. Typically tailrace discharges are reduced by the WSP by 50 to 100 cfs. This range corresponds to the WSP withdrawal of 83.3 cfs from most of the year. Tailrace discharges without the WSP are rarely greater than with the WSP.

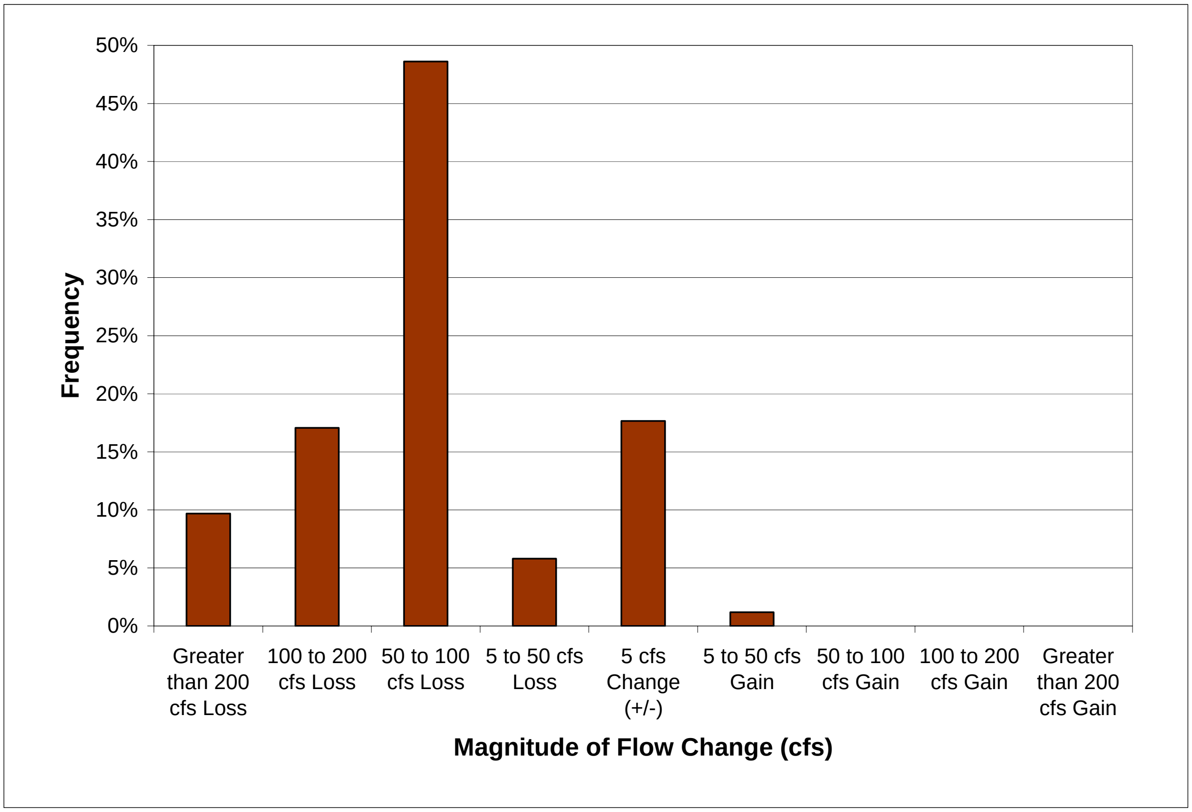


Figure 30 - Change in Tailrace Discharge– Baseline Scenario

<u>Lower Puyallup River</u>

Water quality impacts of the WSP are expected to be minimal in the Lower Puyallup River. Water quality in the Lower Puyallup corresponds to the Lower White River as discussed above. No project impacts occur between the Lower White and Puyallup Rivers, therefore any effect the WSP has on water quality in the White River will be lessened by additional flow volume in the Puyallup River.

<u>Upper and Lower Bound Diversion Scenarios</u>

<u>White River Reservation Reach</u>

The higher instream flow requirements associated with the WSP will change diversions and water quality under all of the scenarios. These new requirements will decrease diversions when flows are lowest, resulting in improved water quality at critical periods – those periods of low flow when the river is most susceptible to violations of water quality standards. However, under the Lower Bound diversion scenario, water supply operations would decrease summer flow in the White River about 70 percent of the time. But in this scenario there is more water in the river to begin with, so flows in the river with the WSP would be about the same as for the Baseline scenario.

As previously discussed, changes in summer water quality correspond with changes in flow. The new minimum instream flows included as part of the project would reduce the highest daily maximum temperatures, from a range of 17-18°C, to a range of 16-17°C. Under the Lower Bound diversion scenario about 70 percent of the time, temperatures would increase as a result of the decrease in flow. However, most of these changes are relatively small; about 70 percent of the changes in temperature are in the range of plus or minus 1 percent.

Under the Upper Bound diversion scenario, water supply operations would increase summer flow in the White River about half of the time. However, flows in the river with the WSP would be generally lower than flows under Baseline and Lower Bound diversion scenarios as a result of sustained, higher flushing rates, except during very low flow, when new instream flow requirements would maintain higher flows in the river.

As with the Lower Bound diversion scenario, the new minimum instream flows would reduce the highest daily maximum temperatures, from a range of 17-18°C, to a range of 16-17°C. Again, most of these changes are relatively small, with about 70% of the changes in temperature in the range of plus or minus 1 percent.

Under the Baseline scenario, the water supply project either improves or does not change flow in the White River roughly 70 percent of the time. As a result, water quality largely improves or remains unchanged. The reason that the water supply project would not change flows in the White River – under either the Baseline or Upper Bound diversion scenarios - is that normally there would be enough water diverted into the lake under baseline operations to satisfy the WSP. As a result, water supply needs would, for the most part, not increase diversions above the baseline and water quality in the river would not change.

On the other hand, under the Lower Bound diversion scenario, diversions during the summer will not be enough to meet the WSP demand. Diversions would increase and thus would have the greatest relative impact on flow and water quality. However the impact to flow and water quality are largely offset under the new minimum flow requirements with the WSP by virtue of the fact that there is more water in the river when compared to the Baseline scenario.

The frequency and direction of the change in water quality are probably more certain than the magnitude. The former are driven by changes in hydrology; when flows in the river improve, water quality improves. Changes in magnitude are less certain, for two reasons. First, models provide estimates of conditions and there is inherent uncertainty in these estimates. Second, Massmann developed his temperature regression using 2004 summer data, when river flows were generally below 1000 cfs. Over the 1991-2002 period of record, summer flows are above 1000 cfs about 30 percent of the time, usually in July. The uncertainty in model results increases when one uses it to make predictions outside of the original data range. Nonetheless, with few exceptions, more flow in the summer improves water quality in the river, and less flow degrades water quality – although in this case, all of the changes are relatively small.

<u>Lake Tapps Reservoir</u>

The hydrologic model results for the Lower Bound Scenario indicate that the WSP would increase summer lake flushing by a factor of 5 (Table 18). The increase in flushing is caused by increased diversion from the White River for the water supply withdrawal. Results for the Upper Bound Scenario indicate that the WSP would result in a 15 percent reduction in flushing. The decrease results from implementation of the higher MIF and the MIF compliant diversion mitigation element. In both cases, residence times with and without the WSP would not be sufficient to control nuisance algae blooms. Controlling algae likely would occur through control of phosphorus.

A future issue for lake managers will be the effect (if any) of changes in annual flushing rates, due to the variation in residence time in different parts of the lake. The central basin of Lake Tapps, located on a more-or-less direct route between the inflow and exit points, probably flushes more quickly than other parts of the lake. Under the Baseline scenario, about 4 times the lake volume (423 percent) will move out through the tail race in any year, on average. Even with variable flushing rates within the lake, that volume of water is probably enough to completely flush the lake, including the peripheral lake basins, every year, assuming 2-3 lake volumes are sufficient to completely flush the lake. If average annual through-flow is reduced by half (i.e. 200 percent of lake volume) the lake may not completely flush in as many years as it now does. The affect of changes in annual flushing rates, if any, is not clear at this time. Ecology is requiring long-term monitoring in the lake partly in consideration of this uncertainty.

Lower White River

As discussed with the Baseline scenario, tailrace discharges are reduced with the WSP under both Upper and Lower Bound diversion scenarios, reducing water quality impacts in the Lower White River. Under the Upper Bound diversion scenario, tailrace discharges with the WSP are reduced 50 to 100 cfs, 54% of the time. This reduction is similar to the results of the Baseline diversion (50-100 cfs 48% of the time, Figure 30). Under the Lower Bound Diversion scenario, tailrace discharges are very similar with and without the WSP. Tailrace discharges are within 5 cfs 54% of the time.

Lower Puyallup River

As discussed with the Baseline scenario, water quality impacts of the WSP are expected to be minimal in the Lower Puyallup River for the Upper and Lower Bound Diversion scenarios. Under all scenarios, the water quality impacts of the WSP are lessened as you move downstream.

3.4.4 Fisheries and Biology

The following assessment is based on the descriptions of the effects of the proposed WSP on the hydrology and water quality characteristics of the White River and Puyallup River systems described in the previous two sections of this ROE. Effects of the WSP are defined as those effects that result from flow and water quality changes to Baseline scenarios. Background information on the fish and aquatic resources of the White and Puyallup Rivers is drawn from TM 26 (HDR 2002) and from other, readily available sources.

3.4.4.1 Existing Conditions

The Puyallup/White River system supports up to eight species of salmonid fishes and has significant anadromous runs of chinook, coho, pink, and chum salmon as well as steelhead and cutthroat trout. Native char (bull trout and/or Dolly Varden) are also reported in the upper reaches of the watershed, although very few char have been captured in extensive beach seining in Commencement Bay (PIE 1998), indicating that few, if any, char move through lower river areas that would be affected by the WSP.

Adult salmonids use habitats in the lower Puyallup River and in the lower White River for upstream migration, including holding during those migrations. The channelized low-gradient nature of both reaches limits the amount of spawning. Juvenile salmonids use the lower Puyallup River and the Reservation Reach for downstream migration and rearing, as well as making the osmoregulatory adjustment necessary for life in salt water.

White River chinook populations include spring and summer/fall runs. Migrating fish enter the river from May to mid-September, as illustrated in Figure 31.

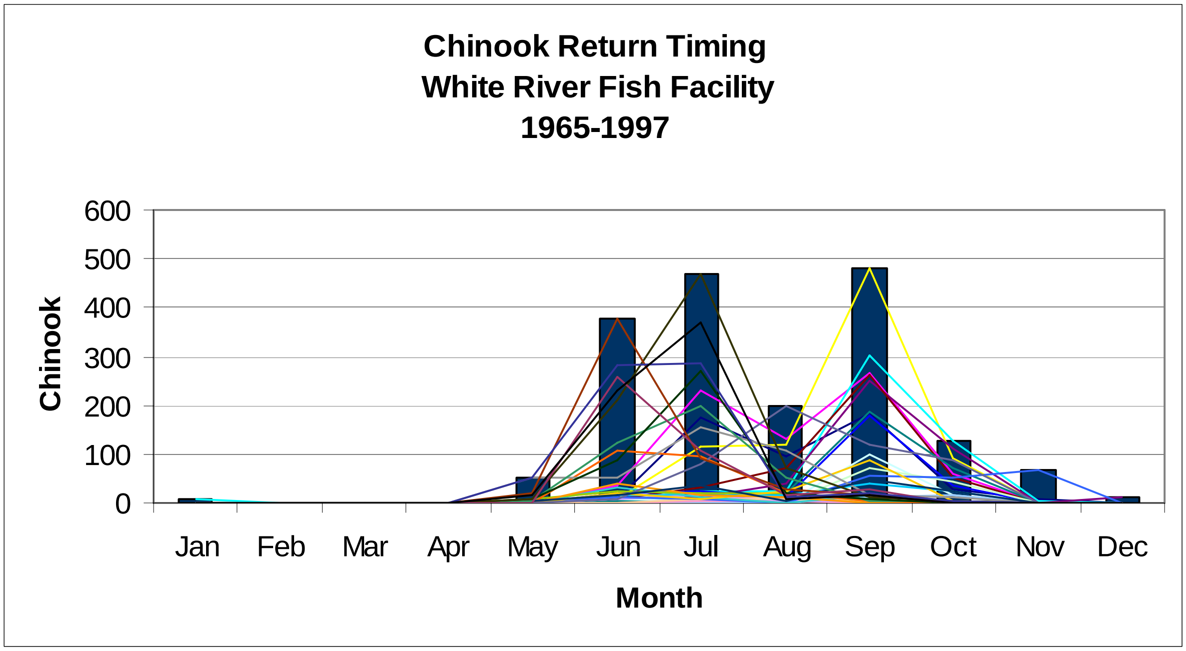


Figure 31 - Chinook Return Timing, White River Fish Facility, 1965-1977 (J. Dillon, USACE).

Hatchery and natural populations of White River chinook spawn in September and October. Spawning is known to occur in the upper White River basin and in the Reservation Reach. Chinook fry emerge from January through March. Studies indicate that a significant portion of spring chinook smolt (up to 80%) and migrate downstream in April and May as subyearlings (WDFW 1996; Dunston 1955). Wild smolts from the White River typically outmigrate as subyearlings and are probably resident in the estuary from April to May (Kerwin 1999). A relatively small portion (20%) of White River chinook outmigrate as yearlings and are not believed to spend significant time in the estuary before migrating offshore. Very little data is available on the oceanic phase of the White River chinook life cycle. White River chinook return to spawn at ages of 2-5 years, with the majority of spawners 3-4 years old (WDFW 1996).

Chinook populations in the White River have experienced several manmade alterations of natural hydrology, most significantly:

1) The White River flowed into the Green River until 1889, when a new channel was dynamited (perhaps accidentally) directing it to the Stuck River, a tributary to the Puyallup. After that the White River periodically switched channels between the Green and Stuck Rivers until 1906, when a flood changed the course of the river, directing it again into the Stuck River. By 1914 channelization efforts permanently diverted the White River into its present course.
2) The White River Hydropower Project was constructed in 1911, blocking fish passage to the upper reaches of the White River. Operation of the hydropower project from 1911 to 2004 significantly altered the hydrology of the White River and the lower reaches of the Puyallup River.
3) Mud Mountain Dam was completed in 1948 and is an impassable barrier to fish.

Over the last century, anadromous salmonid populations (hereafter generalized as "salmonids") indigenous to the system have adapted in varying degrees to these altered conditions. The primary impact during the period of project operation has been the diversion of water into Lake Tapps and the reduced habitat available in the White River between the diversion dam and the tailrace (RM 24.3 to RM 3.6) for salmonid migration, spawning (White River only) and rearing. Past actions of the project, in the form of river dewatering, sediment sluicing, and deficient bypass screens were significant factors for decline of the stock that led to the environmental baseline condition of a population reduced significantly enough that it became listed as threatened under the ESA.

The most dependable source of information for Chinook population started in 1941 with the construction of Mud Mountain Dam; nearly 30 years after the White River Hydropower Project began operation. All past and current estimates of population size are based on trap counts from the U.S. Army Corps of Engineers (USACE) facility (Figure 32). The available trap counts indicate a steady decline in abundance of White River chinook from 1942 through the mid-1980s. In addition to effects from the hydropower project, decreases in abundance were likely associated with increasing anthropogenic actions, including construction of Mud Mountain Dam, intensive logging of the upper watershed, and continuing development and flood control efforts in the valley.

White River chinook were cultured at both NOAA Fisheries facilities in Manchester and WDFW facilities at Minter Creek beginning in 1977 to preserve the population from extinction. These actions were undertaken in direct response to the population decline that resulted, in large part, from effects of the hydropower project. Since the early 1980’s, when minimal chinook were observed, increasing trap counts have been observed associated with efforts to improve fish passage and survival, including increasing the minimum flows in the Reservation Reach, improving fish passage at Mud Mountain Dam in 1995, installing new fish screens at the White River Hydropower Project in 1996, and releasing White River chinook raised in captive broodstock and conventional hatchery programs in the 1990s. In recent years, substantial recovery of the fishery has been acknowledged by WDFW.

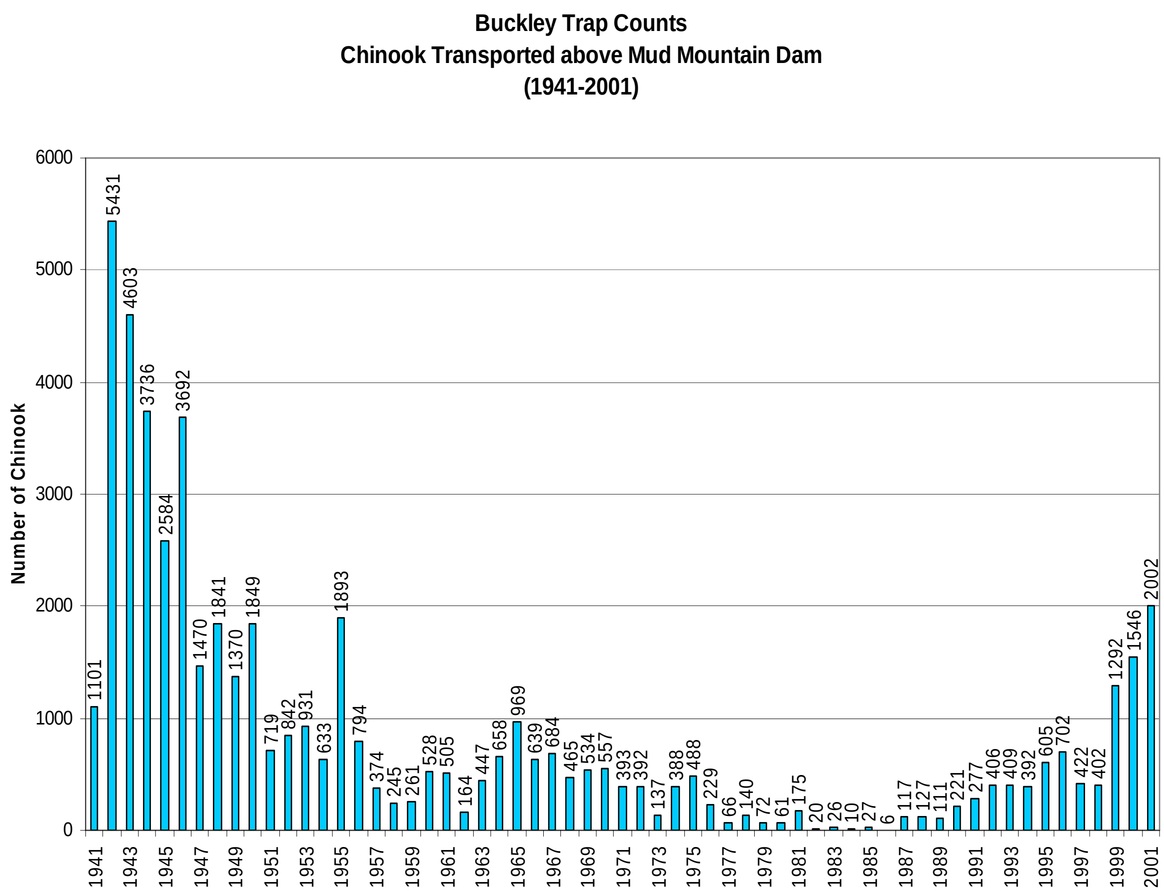


Figure 32 - Buckley Trap Counts, Chinook Transported Above Mud Mountain Dam (1941-2001; J. Dillon, Corps)

The 1986 settlement agreement between PSE (then Puget Power) and the Muckleshoot Indian Tribe increased the required minimum flow below the diversion dam from 30 to 130 cfs, significantly improving habitat in that reach. Increasing trap counts in the 1990s have likely been influenced by the release of over 2,000,000 unmarked, hatchery-reared White River spring chinook between 1992 and 1999. The Muckleshoot Indian Tribe opened a hatchery near the site of the PSE Diversion Dam in 1989 using eggs from the conventional and captive broodstock programs. The first releases were in 1991 and the first adults returned in 1992. Off-site rearing is planned to be phased out when recovery goals are reached. The White River spring chinook hatchery stock is considered part of the Puget Sound chinook Evolutionarily Significant Unit, is listed as threatened, and has been determined to be essential for recovery (64 FR 14308).

In January 2004, PSE ceased operating the hydroelectric project, and average diversions since that date have declined significantly, with flows diverted primarily for refilling of Lake Tapps and maintenance of lake levels. A hydrograph illustrating the differences in Lake Tapps releases during hydropower operations (based on 2001 data) and since the hydropower operation ceased (2004) is presented in Figure 19. The reductions in diversion associated with the cessation of the hydropower project are expected to have significant positive impacts on the local fishery.

3.4.4.2 Methodology

The analyses discussed in the following section are based on Instream Flow Incremental Methodology (IFIM) modeling previously reported on by the USGS, recent IFIM/Weighted Useable Area (WUA) analysis conducted by Ecology, wetted width studies conducted by PSE's consultants (R2 Resource Consultants), stage/discharge relationships analyzed by PSE's consultants, and computer flow modeling conducted by Ecology's consultants (Aspect Consulting) as described in Section 3.4.2.2.

In 1991, the USGS reported on IFIM studies at 3 sites on the Puyallup River (RM 7, 14, and 20), and 2 sites on the White River (RM 3 and 5) to evaluate optimal flow to provide fish habitat based on water depth, velocity, substrate, and cover (Embrey 1991). The White River RM 3 study area is downstream of the Lake Tapps tailrace, and the White River joins the Puyallup River at RM 10.4, just upstream of the Puyallup River RM 7 study area.

The results of the IFIM studies were used in conjunction with water quality data and updated fish preference curves developed by Ecology and WDFW to establish minimum flows in the White River that are protective of the fishery and a condition of the Water Supply Project.

The wetted width and stage height comparisons were conducted for the lower White River and Puyallup River in order to assess the impacts of the WSP on habitat downstream of the WSP.

Water quantity modeling analysis of the effects of the WSP on streamflows is described in Section 3.4.2.3. For consideration of habitat impacts, flow variability as a result of the WSP was assessed during the critical summer low flow period in the Reservation Reach, the lower White River, and the lower Puyallup River. In addition, impact of decreases in flow in the White River following periods when diversion were reduced because the Puyallup River MIF was not being met (i.e. the MIF compliant diversion mitigation element was in effect) was assessed.

The analysis of potential habitat/biological impacts from the flow modeling of the WSP focuses on the most likely diversion conditions, referred to as the Baseline scenario, determined from the diversion history since hydropower production ceased in January 2004, as outlined in Section 3.4.1 and in Table 7. In order to consider a range of potential diversion scenarios, biological effects were also evaluated for Upper Bound and Lower Bound diversion scenarios (see section 3.4.1).

3.4.4.3 Potential Effects of the Water Supply Project

Certain elements of the WSP would provide a direct benefit to biological aspects of the White and Puyallup river system and other watersheds as well through the source exchange component:

Modified 10(j) flows. The Modified 10(j) flows included in the WSP are higher than the required Agency 10(j) flows and would serve as an enhancement to the Reservation Reach of the White River during critical low flow periods, particularly in the fall, as discussed in detail in Section 3.4.2.3.

MIF Compliant Diversion Mitigation Element. Conducting the diversions in conformance with Puyallup MIFs established by WAC 173-510-030 would support fish habitat maintenance goals intended by the WAC during low flow periods in the Puyallup River.

FallDrawdown Enhancement Plan. When the Puyallup River flow is below the MIF in October, the project would release up to 50 cfs from Lake Tapps in order to improve flows. Also, during the fall drawdown period, the release from Lake Tapps would be at least 300 cfs or the amount necessary to meet the MIF. This augmentation plan has been formulated to remedy the potential for the WSP to increase MIF violations at the Puyallup gage during this period, based on the changes in the timing of tailrace releases from those that historically occurred during the hydropower project.

Land Conservation. PSE's agreement to place 2500 acres of land for riparian and wildlife habitat under a conservation easement would provide a direct and long-term benefit to biological aspects of the area.

Source Exchange. Source exchange has been proposed by the applicant (Section 2.3.4.4) as an approach to benefit fisheries in Central Puget Sound watersheds other than the Puyallup-White, by replacing existing water sources that directly impact salmon critical streams with water from the Lake Tapps WSP. The applicant has cited the City of Kent's current voluntary releases (non-diversion by a senior water right) to Clarks Creek, and Covington's current peak day withdrawal of over 13.0 MGD from wells in the Soos Creek Basin, as examples of the order of magnitude that the source exchange program could have. The applicant has stated that specific source exchange scenarios are difficult to quantify at this stage as specific agreements are not yet in place to target areas of need. There are, however, numerous areas that WDFW has identified where low flow issues did arise during the 2001 drought.

During limited periods, diversion from the WSP would result in decreased White River flows relative to baseline scenarios, as noted previously, but most of these occurrences are during high flow periods, and all occur when Modified 10(j) flows and Puyallup MIFs are being met. These decreased flows are not expected to cause a detrimental impact to biological aspects of the river system. Additional discussion of biological effects of the WSP follows:

<u>Baseline Scenario</u>

The wetted width and stage height analysis indicate that the WSP would improve habitat conditions because of the higher MIF relative to baseline, which results in more flow during the critical low flow periods in the Reservation Reach, the lower White River and the Puyallup River. But, the analysis also demonstrates that when MIFs are being met there would be slightly less wetted habitat in the lower White River and lower Puyallup River as a result of the WSP.

The variability of flows caused by the WSP during the critical summer low period has been evaluated. The magnitude of the variability of flows caused by the WSP is relatively small and occurs after MIFs are met in the White and Puyallup Rivers. Similarly the analysis demonstrates that most of the decrease in stream flows following periods when diversions are reduced to avoid MIF excursions are relatively small and infrequent and more than balanced out by the improved flows during critical low flow periods.

The results discussed in Section 3.4.2.3 indicate that negative effects on the surface water hydrology from the WSP under the Baseline scenario are minimal in both the lower White and Puyallup Rivers. Given the differences between streamflows with and without the WSP relative to total streamflows, no significant negative impact on the salmon fishery is expected from these small and limited losses of flow at non-critical times. Moreover, the minimum instream flows state and federal agencies have identified as needed to protect the salmon and steelhead spawning, rearing, and migration (10[j] flows and NOAA recommended flows) would be maintained or exceeded by the WSP, based on the Modified 10(j) flows included as a condition of this permit. Model results confirm that the WSP would have a positive impact in reducing the net number and volume of MIF excursions.

The net effect of the WSP under the Baseline scenario would be expected to be very limited, given that the main impacts of the WSP would be some reduction in White River flows during rare occurrences where the White River and Puyallup River MIFs are met, but local inflows plus the baseline diversion are insufficient to provide water supply and maintain the reservoir level, resulting in relatively high diversion levels.

Little spawning occurs in affected reaches because of the nature of the river morphology and geomorphology. Any spawning that does occur in affected reaches is already occurring in adverse conditions (e.g., high sand content and embeddedness; high variation between daily flow maxima and minima) that would only be slightly altered by the proposed WSP.

Changes in water quality (see Section 3.4.3.3) (temperature and DO) would generally be slight and typically in a direction (lower maximum temperatures and higher minimum DO) that are more favorable for cold water species and for salmonid swimming performance and predator evasion. In the White River, the decreases in flow caused in some circumstances by the WSP would have the net result of increasing temperature slightly, but temperatures would not exceed the state standard of 18^{o} C, and DO violations are also not expected. Based on these findings, biological effects are expected to be insignificant. When the Fall Drawdown Plan is implemented, increased relative flow from Lake Tapps may slightly increase temperature and decrease DO below the tailrace, but significant biological effects are not anticipated.

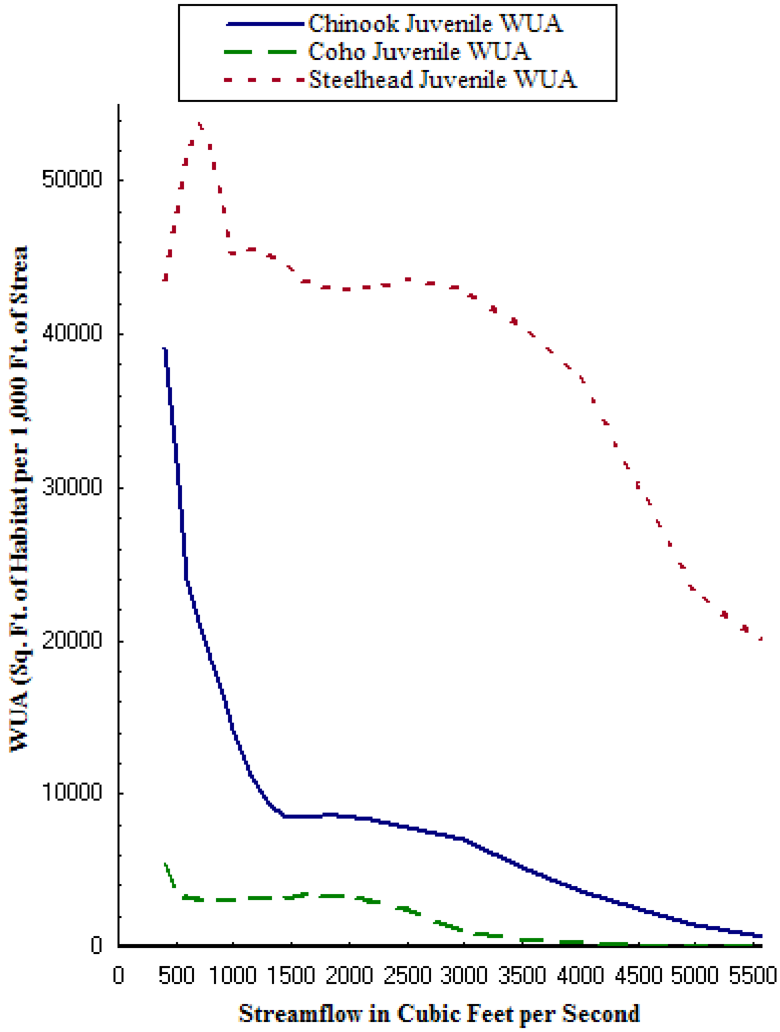
Off-channel habitat restoration in the lower Puyallup River has been deemed of the utmost importance to the recovery of salmon runs in the system (Simenstad 2000). Water levels in the lower Puyallup River are reduced slightly during certain times by the WSP, with average stage reductions of 0.09 feet, and maximum decreases of 1.5 feet. However, during some MIF excursions, up to a 0.5 foot increase in stage can be expected. It is expected that most existing and newly-constructed off-channel habitat would be accessible over a wide range of flows and that access into the habitat areas would not be a significant problem for well designed restoration projects.

<u>Weighted Useable Area/IFIM Analysis</u>
The USGS IFIM study concluded that fish habitat peaks at flows in the White River at RM 3 from 300 to 900 cfs for salmon and steelhead spawning and from 180 to 300 cfs for salmon and steelhead rearing. The study also estimated a chinook spawning peak of 900 cfs. This reach of the river is known by Ecology to be a low use spawning area for chinook, given the tendency for spawning to occur higher in the watershed.

A spawning habitat flow at 500 cfs, equal to the fall Modified 10(j) MIF would be a benefit of the WSP. A flow of 500 cfs would be about 90 percent of the peak habitat flow, and could be expected to allow more than adequate habitat given the limited documented spawning use in the area. This flow requirement is significantly higher during the fall than the Agency 10(j) flow range of 339 to 490 cfs, and would be expected to result in a direct benefit to the fishery during this time period. As illustrated by Figure 6, flows in the White River are predicted to be higher during the fall as a result of the WSP for a drought scenario with the requirement for the Modified 10(j) MIF implemented.

The USGS study concluded that the IFIM optimum flows for the Puyallup River at RM 7 (3.4 miles downstream of the White River confluence) are 1500 cfs for pink and chum spawning and 390 to 600 cfs for salmon and steelhead rearing. Substantial spawning activity in the lower Puyallup River is not currently supported as there are only a few shallow spawning bars in this area, and they typically are inundated with people standing and fishing on the bars during low stream flows associated with salmon migration and spawning in September and October.

The Department of Ecology used the data available in the USGS report and updated default preference curves to run the IFIM model for the Puyallup River at RM 7. The Weighted Useable Area (WUA) results for the Puyallup River for salmonid juveniles showed peak fish habitat values at streamflows similar to the 1991 USGS results (Figure 33). This recent IFIM modeling found coho and chinook WUA values peaked at 400 cfs, while steelhead juveniles peaked at 700 cfs. In comparison, the USGS study indicated similar results, with coho and chinook juvenile WUA values peaking at 390 cfs and steelhead juveniles peaking at 600 cfs. As part of WSP mitigation measures, no diversions would occur for any purpose when flows are below the Puyallup River MIF. Fall MIFs at the gage are at least 1000 cfs, significantly above estimated peak fish habitat values based on WUA results. Since diversions would not occur when flows are below MIFs, the WUA studies suggest that the WSP would not significantly affect habitat in the lower Puyallup.



Flow (cfs)	Chinook Juvenile WUA	Coho Juvenile WUA	Steelhead Juvenile WUA
400	**39136**	**5373**	43566
500	31673	3507	47632
600	24021	3271	51595
700	21205	3087	**53514**
800	18819	2998	52201
900	16591	3028	48167
1000	14165	3040	45263
1150	11250	3188	45577
1300	9395	3105	45364
1450	8529	3128	44520
1600	8522	3408	43568
1750	8569	3348	43125
1900	8630	3315	42856
2050	8502	3307	42940
2200	8302	3045	43070
2500	7884	2453	43514
3000	7102	1096	43015
3500	5271	386	40537
4000	3596	232	37040
4500	2540	98	30115
5000	1439	35	23215
5500	747	11	20521
6000	321	29	19167
6500	185	57	18131
7000	119	101	16924
8000	34	203	14035
9000	60	239	10390
10000	104	324	6338
12000	99	485	855
14000	208	555	432

Figure 33 - Fish Habitat (WUA) vs. Flow: Puyallup River near Puyallup

Wetted Width Studies

R2 Resource Consultants conducted a study on wetted width for the lower White River and the lower Puyallup River (Ramey 2004). As a result of the WSP, wetted width for the lower White typically increases with the WSP during low flow periods because of the Modified 10(j) MIF requirements. The Baseline scenario simulations indicate the increase in flow during low flow periods (August, September and October) can be up to 300 cfs in the lower White River (e.g., from 400 cfs without the WSP to 700 cfs with the WSP). The corresponding increase in wetted width of approximately 4.9 percent would be a direct benefit of the WSP. However, when MIFs are met the WSP would decrease flows downstream of the project relative to baseline.

When flows are above MIF, the change in wetted width becomes less significant because of the higher flows. As an example, simulations indicate the average flows in the lower White River during the August to October low flow period would decrease from 877 cfs without the WSP to 731 cfs with the WSP. This reduction of 146 cfs because of the WSP would result in a loss of approximately 1.9 feet of width or 1.8 percent of the wetted width.

With respect to the Puyallup River, as noted in Section 3.4.2.3, any reductions in flow volumes associated with the WSP in the lower Puyallup River are predicted to be similar to those in the White River, but the relative magnitude of the effects is significantly less, because of the much higher streamflows associated with the Puyallup River. Consequently, there are improvements in wetted width during critical low flow periods as a result of the higher White River MIF associated with the WSP and slightly less wetted width the rest of the time as a result of the water supply withdrawal. Simulations indicate the average flows in the Puyallup River during August through October would decrease from 1878 cfs without the WSP to 1732 cfs with the WSP. This loss of 146 cfs would result in a loss of approximately 1.3 feet of wetted width, or approximately 0.7 percent of the wetted width. As is the case in the lower White River, the periods of slight decrease in wetted width primarily occur when minimum instream flows have been met.

Wetted widths are also improved in the Reservation Reach of the White River during low flow periods because of the higher MIFs included in the WSP. The slight decrease in wetted width relative to baseline when MIFs are met does not occur in the Reservation Reach as it does in the lower White and Puyallup Rivers which are downstream of the water supply withdrawal.

Stage Elevation Studies

The results of the stage elevation study mimic the wetted width studies in that there would be slight increases in stage elevation when MIFs are not met in the White and Puyallup Rivers and slight decreases when MIFs are met. During the fall low flow period (August through October), the average flow in the lower White River would be reduced from 877 to 731 cfs, which corresponds to a decrease in stage of 4.6 inches (0.38 feet, from 30.81 feet to 30.43 feet). In the Puyallup, the average flow in August through October would decrease from 1878 to 1732 cfs, which corresponds to a decrease in stage of 1.92 inches (0.16 feet, from 10.53 feet to 10.37 feet).

Looking at annual average flows reveals even smaller changes in stage. The annual average flow in the lower White River would be reduced by 100 cfs (from 1648 cfs to 1548 cfs), and would result in a decrease in stage of 2.75 inches (0.23 feet, from 32.63 feet to 32.40 feet). In the Puyallup River, a decrease in average flow of 100 cfs (from 3282 cfs to 3182 cfs) would cause a decrease in stage of 1.08 inches (0.09 feet, from 11.88 feet to 11.79 feet).

Flow Changes

As noted in Section 3.4.2.3, the WSP decreases flows in the Reservation Reach during rare occurrences where the White River MIFs are met but local inflows combined with baseline diversions are insufficient to provide water supply and maintain the reservoir level leading to increased diversions relative to baseline. Figure 25 and Figure 26 demonstrate this variability for the low flow summer period in the Reservation Reach of the White River. The WSP would cause some increases and some decreases of flow in the river, but most of the changes are small and on balance tend toward increasing flows because of the higher MIFs associated with the project. The magnitude of changes in Figure 25 and Figure 26 would be relatively smaller in the lower White and lower Puyallup River because of the increased volume of flow in these reaches.

Following periods when MIFs are not met on the White or Puyallup River and diversion to Lake Tapps has stopped, the WSP would divert additional water to refill the reservoir. This diversion would cause a reduction in flow in the River compared with the previous day when the project. This creates potential impacts to habitat during low flow periods when diversions begin and flows in the White River are potentially reduced suddenly. Sudden reductions in flow in the White River during low flow periods can strand juvenile salmon in side channels away from the river. To assess this potential impact, the reduction in flow in the White River after the MIF related cessation of diversion was evaluated. Table 19 counts the number of monthly occurrences where flow in the White River is reduced during low flow periods (250-500 cfs, 500-1000 cfs, and 1000-1500 cfs). The data in Table 19 show that over 71.2% of these flow decreases would be less the 50 cfs, and unlikely to have a negative impact on habitat. The magnitude of changes from post-MIF diversions would be relatively smaller in the Puyallup River because of the increased volume of flow in this reach.

Table 19 - Number and Magnitude of White River Reductions in White River Flow

Number of Occurances of White River Flow Reductions due to MIF Diversions by White River Flow and Magnitude of Flow Change												
		Decrease in White River Flow after MIF Compliannce (cfs)										
Month	White River Flow	0 to 25	25 to 50	50 to 75	75 to 100	100 to 125	125 to 150	150 to 175	175 to 200	200 to 225	225 to 250	>250
1	250 to 500	2										1
	500 to 1000	1										
	1000 to 1500											
2	250 to 500											
	500 to 1000	3										
	1000 to 1500											
3	250 to 500	1			1							1
	500 to 1000	6	3	4	2							
	1000 to 1500	2	4	1	2							3
4	250 to 500											
	500 to 1000	4		3	2							
	1000 to 1500	2		3								1
5	250 to 500											
	500 to 1000	1										
	1000 to 1500	2	3					1				
6	250 to 500											1
	500 to 1000											
	1000 to 1500	2	2	3	1		2		1			1
7	250 to 500	1										
	500 to 1000	4	2	3								
	1000 to 1500	2	1	2	1	1		2				
8	250 to 500	3	1	1			1					1
	500 to 1000	14	5	1	1			1	1			
	1000 to 1500	1	1	1								
9	250 to 500	9	6	3		1		1				1
	500 to 1000	4										
	1000 to 1500											
10	250 to 500	5	5	1								
	500 to 1000	55	2	1			2	2		1		1
	1000 to 1500											
11	250 to 500	1										
	500 to 1000											
	1000 to 1500											
12	250 to 500	1										
	500 to 1000											
	1000 to 1500											
	Total	126	35	27	10	2	5	7	2	1	0	11
	%	55.8%	15.5%	11.9%	4.4%	0.9%	2.2%	3.1%	0.9%	0.4%	0.0%	4.9%

Upper and Lower Bound Diversion Scenarios

The biological effects of the Upper and Lower Bound diversion scenarios are generally similar to that for the Baseline scenario. As noted in Section 3.4.2.3., the Upper Bound diversion scenario increases the average flow in the Reservation Reach by 42 cfs. Under the Lower Bound diversion scenario, a net loss of 51 cfs is predicted for the Reservation Reach, but in terms of biological effects, it has the highest flows of all the diversion scenarios, and the net biological effect of the 51cfs loss is expected to be minimal because minimum flows have to be met before water is diverted into Lake Tapps. Effects on the lower White and lower Puyallup Rivers are consistent with those expected under the Baseline scenario.

4.0 FOUR PART TEST

To approve these applications, Ecology must find each of the following four requirements of RCW 90.03.290 have been satisfied:

1. Water is available for appropriation;
2. The proposed use would be a beneficial use;
3. The proposed appropriation would not impair existing water rights; and
4. The proposed appropriation would not be detrimental to the public interest.

4.1 Availability of Water

In March 1980, Ecology promulgated rules that set forth the provisions for future allocation of water from the Puyallup River Basin (Chapter 173-510 WAC). The stated purpose of the rules is to:

> *Retain perennial rivers, stream, and lakes in the Puyallup River basin within stream flows and levels necessary to provide protection for wildlife, fish, scenic-aesthetic, environmental values, recreation, navigation, and to preserve high quality standards (WAC 173-510-020).*

Relevant to this application are the provisions in the rule that close the White River and all tributaries "to further consumptive appropriations" WAC 173-510-040(3). The rules also establish specific instream flows on the lower Puyallup River which is defined as "from the influence of the mean annual high tide at low base flow levels to the confluence with the White River." WAC 173-510-030(1). The specific instream flows for the lower Puyallup River are provided for in WAC 173-510-030(2). These flows range from 1,000 cfs in the fall to 2,000 cfs in May to July.

The applicant has proposed to use water for municipal supply purposes in a manner that would not reduce the number of days of non-attainment of the minimum flows for the lower Puyallup River. However, the applicant's proposed use of water would impact the lower White River from the tailrace of former PSE hydropower plant to the confluence with the Puyallup River, since the water proposed to be withdrawn for water supply would otherwise be flowing in the lower river. Further, the WSP diversions from the White River have the potential to affect the Reservation Reach, insofar as the timing and the amount of those diversions may vary from that of the baseline condition. Under Chapter 173-510 WAC, the White River is closed from further consumptive appropriations. Stream "closures" are determinations by the Department under RCW 90.54.020 that water is not *available* for further appropriations. See Postema v. PCHB, 142 Wn.2d 68, 95, 11 P.2d 726 (2000).

However, a stream closure under the authority of RCW 90.54.020(3)(a) may in certain circumstances be overridden under an exception in that statute. That exception states that a new appropriation from a closed stream may be authorized

> "in situations where it is clear that overriding considerations of the public interest [hereinafter OCPI] will be served."

In making a statutory determination of OCPI under RCW 90.54.020(2)(a), the analysis here uses three steps:

1. Determine whether and to what extent important public interests would be served by the proposed appropriation. The public interests served may include benefits to the community at large as well as benefits to the river or other environmental resources.
2. Determine whether and to what extent the proposed appropriation would harm any of the public interests (fish, wildlife, scenic, aesthetic, and other environmental and navigational values) protected by the closure and/or any other public interests.
3. Determine whether the public interests served (as determined in step 1) clearly override any harm (as determined in step 2).

The following section of this report presents this three-step OCPI analysis:

Step 1: Analysis of Public Interests Potentially Benefited by the WSP

Public Water Supply Benefits. The WSP would provide a significant source of public water supply for addressing future needs of customers and businesses served by the cities and water utilities that comprise the CWA. Further, because of its scale and the central location of the contemplated transmission system, the WSP would provide a potential source to meet other public water supply needs within the Central Puget Sound region and thereby increase reliability of meeting future demands. Providing reliable public water supplies that meet the needs of population and economic growth is an important state policy recognized in RCW 90.54.010 & 020. As discussed in Section 3.3.1, the supply and demand analysis predicts that without the Lake Tapps supply CWA members would have an average unmet demand of 22.42 MGD by 2034 and of 54.41 MGD by 2054 (see Table 4). The level of unmet demand would increase if other utilities use project water to address future needs.

Improved Flows in Flow-Impaired Streams in Watersheds Where Lake Tapps Water Would Be Used. The WSP commits to a Source Exchange Program that will use project water to displace wells and surface water diversions that impact flow-impaired salmon streams during critical periods. The objective of the program is to use source exchange water in a manner that will provide the greatest biological benefit to flow-impaired streams in watersheds served by project water. Currently this would include watersheds in both King and Pierce Counties. The WSP commitments to source exchange are as follows: during Phase I the permit holder will provide a minimum of 4 MGD source exchange water, capped at 4,500 af/yr, to address source exchange needs identified to exist among any utility receiving water from the WSP. After Phase II commences, the commitment increases to 8 MGD, capped at 11,000 af/yr.

Protection of Riparian or Adjacent Wildlife Lands. As part of its public interest proposal for this application, PSE has agreed to place 2500 acres of riparian and adjacent wildlife land in the White River Basin under a conservation easement. This will secure the continued protection of this habitat for fish and other wildlife as well as provide opportunities for other recreation and environmental education.

Increased Likelihood of Maintaining Lake Tapps as a Recreational, Aesthetic, Groundwater Recharge and Wildlife Resource. Lake Tapps was created as the reservoir for the White River Hydropower Project. Continuing diversion of water from the White River into Lake Tapps is an expensive and resource intensive effort, since it involves the maintenance (and periodic replacement) of the diversion dam, canal, flume, fish bypass structure, sediment traps, levees and dikes that retain waters of the lake, the project intake, the project structure, and the tailrace. Because the hydropower project is no longer operating it can no longer be assumed that PSE or another owner will be willing or able to pay the costs of providing this benefit. At present, the WSP is the only viable proposal that appears to have the financial and organizational resources to continue to maintain Lake Tapps and the benefits it provides. The Lake is heavily used during the recreation season for boating and swimming, and the County Park is among the most popular swimming areas in Pierce County. The lake, covering 2,700 acres, also provides wildlife habitat to significant number of species, including fish, waterfowl, and terrestrial wildlife that depend on the lake for food, habitat, or water. Further, the lake provides recharge to local aquifers that provide water to surrounding communities including the Cities of Auburn, Pacific, Sumner, Puyallup, and Bonney Lake.

Improved Aquatic Habitat and Water Quality in the 21-Mile Reservation Reach of the White River as a Result of Improved Instream Flows. As a condition of WSP, diversions from the White River for the WSP will be required to comply with a new and more protective instream flow regime for the Reservation Reach of the White River. These flows are set forth in condition 5.3.3a (see Table 20~~Table 20Table 20~~). Recommended by NOAA Fisheries, these flows are the highest flow levels that a federal or state governmental agency has recommended to date. The existing PSE water right for the former hydropower use does not require compliance with such flows, and thus, the WSP would result in a flow enhancement. The water quality analysis (Section 3.4.3.3) indicates that these flows will improve temperature in the Reservation Reach, particularly during critical low-flow periods. The fishery impact analysis (Section 3.4.4.3) indicates that these flows will also improve fish habitat in the Reservation Reach, especially during the critical summer and fall months.

Improved Aquatic Habitat in the Lower White/Puyallup Rivers from the Minimum Instream Flow Compliant Diversion. The WSP will be required to implement the MIF Compliant Diversion mitigation element (see condition5.3.4). This mitigation element requires that all diversions (except for necessary fish bypass flow) from the White River cease to the extent necessary to comply with the MIFs established for the lower Puyallup River. Comparing the WSP to the no-WSP under the Baseline diversion scenario, the modeling results (see Section 3.4.2.3) estimate the number of instances of noncompliance with Puyallup MIFs would be reduced by 15 percent and the volume of Puyallup MIF shortfall reduced by 21 percent.

Step 2: Analysis of Potential Public Interests Potentially Harmed by the WSP

Impacts to Habitat in the Lower White and Puyallup Rivers Resulting from Reduction of Daily Average Flow. The WSP would reduce flow in the lower White and Puyallup Rivers by 100 cfs on average. This reduction in flow would result in a loss of fish habitat. Because of the higher MIFs and compliance with the MIF at the diversion dam included in the WSP, these decreases in flow would primarily occur when flows were above the Puyallup River MIF. During low flow periods, the WSP would increase flows in the rivers, improving aquatic habitat. The loss of aquatic habitat was quantified using WUA, wetted width, and change in stage approaches. In low flow months, the wetted width would reduce an average of 1.8 percent in the lower White River and 0.7 percent in the Puyallup River. The loss of habitat is smaller during higher flow periods of the year. Thus, the loss of habitat is small and does not occur during the most critical periods.

Impacts to Habitat and Water Quality in the Reservation Reach of the White Rivers Resulting from Refill after MIF Excursions. The mitigation elements included in the WSP would be effective in reducing the number of Puyallup River MIF excursions, and increasing flows in the White River during critical low flow periods. However, while the project is not diverting water in order to increase low flows in the river, the reservoir would be drawn down by the water supply withdrawals. After the low flow period has passed and flows are once again above MIFs, diversions would increase in order to recover recreational levels in the reservoir.

Overall, flow in the Reservation Reach would be unchanged or increased 87 percent of the time. The decreases occurring the remaining 13 percent of the time would typically be less than 200 cfs and would last for less than 7 days. During these periods there would be minor reductions in water quality and availability of fish habitat. The magnitude of these changes is small and does not occur during the most critical periods.

Potential Impact to Lake Recreation during Drought Years. As indicated above, it is entirely possible given the large cost of maintaining Lake Tapps, that if the WSP does not go forward that the diversion which feeds the lake will be closed down resulting in the eventual drainage of the lake. However if Lake Tapps would otherwise continue absent the WSP, during some years the project would, during some low water periods, impact on-lake summer recreation by drawing down Lake Tapps below recreational lake levels. This impact is caused by the water supply withdrawals. The model results suggest that in drought scenarios, the lake would be drawn down below recreational levels during late summer. During the 12 year period simulated, the lake was below recreational levels for only 44 days, or 3.6 percent of days between Memorial Day and Labor Day. Drawdown below recreational levels occurred during only 3 of the twelve years. (see Table 10). Given that it is unknown whether the Lake would continue to exist absent the WSP (as no other viable proposal with adequate financial means to maintain the lake has been advanced), this potential impact is somewhat speculative.

Step 3: Conclusion of OCPI Analysis

We conclude that the public interest benefits of the WSP *taken as a whole* clearly override any public interest detriments associated with the WSP. We find the overriding public interest benefits to be as follows:

1. The WSP will provide a significant new water supply to address reasonably foreseeable needs of CWA members and the region;
2. The WSP will provide relief to flow-impaired streams through source exchange;
3. The WSP will increase minimum flows in the White River during summer and fall which will improve water quality and enhance salmonid habitat in the Reservation Reach, lower White and lower Puyallup Rivers
4. The WSP will improve critical fish habitat in the lower Puyallup River by reducing MIF excursions; and
5. The WSP will result in securing protection for 2500 acres of riparian and adjacent wildlife land in the White River Basin for the benfit of fish and wildlife through the establishment of a conservation easement..

We considered the reduction of flows in the lower White and Puyallup rivers in our analysis. That reduction, especially in the lower Puyallup is relatively minor, and also does not occur during times when flows are below the required MIFs. The effects on water quality and fish habitat are minor, especially in light of the improvement to water quality and fish habitat that will result from the higher Reservation Reach instream flows and reduction in the number of days that Puyallup River minimum flows would otherwise not be met. Finally, we considered the effect on lake levels from the WSP. As indicated above, the WSP increases the likelihood of the lake being continued so that it will continue to provide recreational, wildlife, and recharge benefits. Even assuming that the lake would otherwise continue as it is now operated, the reduction in lake levels during the primary recreation season would be relatively small. For the reasons stated above, we conclude that an OCPI exception to the closure of the White River is clearly warranted, and therefore that water is available for this new appropriation.

4.2 Beneficial Use

The beneficial use analysis involves answering two questions:

1. Is the proposed use a beneficial use?
2. If so, does a reasonable basis exists to conclude that the project proposed in the application will beneficially use the water quantity sought within a reasonable period of time?

As to the first question, the proposed use is for public water supply and municipal water supply, including industrial and commercial supply. These purposes are all recognized under RCW 90.54.020 as beneficial uses of water. Under the recently enacted statutory provisions, PSE as a deliverer of water for municipal supply that provides water for more than 15 residential units or CWA as an assignee of this permit would be a municipal water supplier (RCW 90.03.015).

As to the second question—the reasonable basis for the projected beneficial use—the supply and demand analysis projects that the supply deficit for CWA Members in 2034 and 2054 will be 22.42 MGD and 54.41 MGD, respectively. In addition to the projected supply deficit, the source exchange program included in PSE's application would use up to 9.8 MGD. The deficit would increase if a higher level of demand occurs, other utilities in the region purchase project water, or source exchange exceeds minimum levels or estimated use. We conclude that the average annual amount of 64.6 MGD that PSE has applied for is reasonable in light of this analysis. However, because the analysis is predicated upon projections of demands and supplies 48 years in the future, it is appropriate to provide a mechanism to true up the quantity permitted with the need projected at a time closer to the time when full use would occur. Thus, this permit provides that in 2036 Ecology will reassess the level of need projected for 2054, and if the reasonably projected need (including source exchange requirements) is less than 64.6 MGD, the amount of the permit will accordingly be reduced in a superseding permit.

Having found a reasonable basis for the annual quantity projections, we now turn to the instantaneous quantities sought. PSE has filed two separate applications involving two appropriations, a primary one of 2,000 cfs (QI) and 72,400 af/y (QA) from the White River, and a secondary one of 150 cfs (QI) and an average annual average of 100 cfs (QA) from the Lake Tapps reservoir. However, the hydropower project has ceased operations so that the project is no longer diverting flows up to 2,000 cfs. Under the change decision to PSE's existing claim made contemporaneously with this decision, the maximum diversion is 500 cfs during the refill period and 375 cfs at other times (subject to other limitations) for all authorized purposes except the hydropower purpose. Ecology's hydrologic modeling has shown the WSP can be fully operated to meet all water supply needs with a considerable margin of safety within these limits. As set forth below, this decision provides that the diversion from the White River shall not exceed 500 cfs during refill and 375 cfs at other times, and further that such diversions shall be reduced by any limitations imposed by the diversion minimization plan condition required herein.

The conclusion that the amount of water applied for and the time to develop the right is reasonable and not speculative is further reinforced by the fact that water availability for meeting future population and economic growth in central Puget Sound is becoming increasingly scarce and the planning horizon for locating and permitting new public water supply sources and needed infrastructure has considerably lengthened. Thus, a longer time horizon for assessing the need for future municipal supplies under these circumstances is appropriate.

In summary, the reasonable basis for beneficial use on an annual basis is supported here in three ways. First, supply and demand data and source exchange commitments indicate a reasonable need for the water sought over the time period in question. Second, the permit places a mid-course check on the amount permitted to correct any overestimation of need that may exist due to the 50-year term of the permit. Finally, in the central Puget Sound region it is appropriate to assess need on a longer timeframe for new large public water supplies which require increasingly longer periods of time to permit and develop.

4.3 Impairment

To grant a permit Ecology must find that the third test of RCW 90.03.290 is met, that the appropriation will not impair any existing water rights. PSE has filed two separate applications involving two appropriations, a primary diversion of 2,000 cfs (QI) and 72,400 af/y (QA) from the White River, and a secondary diversion of 150 cfs (QI) and a average annual average of 100 cfs (QA) from the Lake Tapps reservoir. Each application must be examined separately for purposes of impairment.

4.3.1 Primary appropriation of 2,000 cfs, 72,400 af/y from the White River

Until January 2004, PSE diverted 2,000 cfs from the White River for hydropower generation at the same point of diversion that would be used for the public water supply diversion. This diversion was made pursuant to a pre-code water right for which PSE filed a claim on June 10, 1974, asserting a right to divert 2,000 cfs for hydropower production. Since January 2004, PSE ceased generating hydropower and continued to divert water to maintain the fish bypass flows, and water levels and water quality in Lake Tapps.

On November 22, 2005, PSE filed an application to change to their claim to add additional purposes of use, specifically, fish and wildlife enhancement, and to maintain the water levels and water quality of Lake Tapps.[10] The application also voluntarily agrees to make these uses subject to the original Agency 10(j) flows (see Table 2). Concurrent with this ROE, Ecology is approving the change application for the sought purposes in the following quantities: diversions up to 500 cfs are permitted only during the Spring Refill period (March 1st to May 15th), during the Lake Tapps water quality study (see condition 5.3.8 below), and as may be approved by Ecology under the Diversion Minimization Plan (see condition 5.3.11); at all other times diversions shall be no greater than 375 cfs; all diversions shall be in accordance with the Diversion Minimization Plan and the agency 10(j) flows.

PSE has proposed that the new appropriation for public water supply be conditioned so that the combined diversion from the river under the claim and the WSP will not exceed the instantaneous quantities authorized in the change of the PSE claim.

The water quantity model suggests that the annual quantities diverted from the White River would be reduced approximately 2 percent by the WSP under the Baseline Diversion scenario. Under the Upper Bound scenario, diversions would be reduced 12 percent. Under the Lower Bound scenario diversions would be increased up to 70 percent, but the higher instream flows required by the WSP ensure that this reduction would not be harmful and average diversions under the WSP would still be only 1/9 of the historical average diversions. (See Table 8)

4.3.2. Secondary Appropriation of 150 cfs (QI) and an Average of 100 cfs/yr (QA)

The secondary appropriation is for public water supply withdrawals from Lake Tapps. During regular operations of the WSP, a reduction in daily average flows of up to 150 cfs would occur in the lower White River and downstream in the Puyallup River.

4.3.3 Review of Potential Impairment

The WSP contains a number of provisions intended to prevent any reduction or alteration in flow from impairing other existing water rights and in particular the water right established under WAC 173-510-030 to provide MIFs on the Puyallup River. MIFs may be impaired if a new appropriation will increase the duration or extent of shortfall below MIF levels.

During times the MIFs are not met at the Puyallup River gage, PSE has committed under the MIF Compliant Diversion mitigation element not to divert water under the claim or the WSP right, and

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[10] In the application PSE asserts that its existing claim already permits these uses, but because of the legal uncertainty, it is requesting acknowledgement in a formal change decision.

that provision is a condition of the decision. This mitigation element has not only the effect of preventing any MIF excursion caused by the WSP but also of eliminating any MIF excursion that might be caused by the claim that is senior to the MIF. In essence, PSE's commitment provides an enhancement to the lower White and Puyallup rivers.

Turning now to the question of potential impairment of any existing water rights other than the MIF, we are unaware of any past incidence where any existing right has been unable to be fully utilized due to flow issues in the lower rivers. We are unaware of any basis for concluding that the anticipated reduction in flow conditions in the lower White River is likely to adversely impact any of these existing rights.

The Puyallup Tribe of Indians and the Muckleshoot Indian Tribe assert that the WSP would impair water rights they claim under treaties, federal reservations, and aboriginal rights. Under the treaties of Medicine Creek (1854) and Point Elliott (1855), the Puyallup Tribe of Indians and the Muckleshoot Indian Tribe retain the right to take fish in their "usual and accustomed" areas, inclusive of the Puyallup/Carbon/White River Basins. The White and Puyallup Rivers and their tributaries are among the Tribes' usual and accustomed fishing places and the Tribe relies upon fish runs that use the habitat of these rivers in exercising its protected treaty fishing rights. The Puyallup and Muckleshoot Tribes utilize fish from these basins for commercial, subsistence, and cultural purposes. Several courts have recognized reserved treaty rights for water to preserve fishing rights. *United States v. Adair,* 723 F.2d 1394 (9^{th} Cir.), *cert. denied*, 467 U.S. 1252 (1984); *Ecology v. Yakima Res. Irr. Dist.,* 850 P.2d 1306 (Wash. 1993).

In addition to water quantity issues, the Puyallup Tribe of Indians, with authority delegated from EPA, has adopted water quality standards for the Puyallup River within the Puyallup Tribe's historic reservation. The White River runs through the Muckleshoot Indian Tribe's Reservation, and EPA has retained its authority for setting water quality standards in the Reservation Reach of the White River, until such time as the Tribe applies for, and the EPA delegates, standard setting authority.

A court has not adjudicated the validity and quantity of tribal water rights to water of the White and Puyallup Rivers. Nor have the Tribes identified a specific quantity for purposes of their impairment claim. Our earlier conclusions that the WSP will improve instream flows, fish habitat, and water quality in the reservation pass reach, cause no significant negative impact on water quality in the lower White and Puyallup rivers, cause no excursions of MIFs in the Puyallup, and eliminate a number of the Puyallup MIF excursions that would have otherwise occurred lead us in turn to conclude that the WSP will not impair any tribal rights to flows that are necessary to support the fisheries. If, however, at a future point in time, evidence of actual or likely impairment of a tribal right should arise, the Tribes can seek legal relief to protect their senior rights.

4.4 Public Interest

The fourth and final test for issuance of a water right permit is the requirement that the appropriation not be detrimental to the public interest. The effects of the WSP on the public interest were already analyzed above in Section 4.1 above, where it was concluded that overriding considerations of public interest clearly support the granting of the applications.

5.0 RECOMMENDED DECISION

Based upon our findings that the applications meet each of the four tests for approval under RCW 90.03.290, we recommend that the applications be approved pursuant to the following development schedule and conditions:

5.1 Quantities Approved

- Surface Water Permit S2-29920 in the amount of 500 cfs, not to exceed a withdrawal of 72,400 af/y, of water from the White River for municipal water supply and related recreational and water quality purposes. Diversions up to the 500 cfs cap are permitted only during the Spring Refill period (March 1st to May 15th), during the Lake Tapps water quality study set forth in 5.3.8, and as may be approved by Ecology under the Diversion Minimization Plan set forth in 5.3.11. Otherwise, the diversion cap shall be 375 cfs.
- Reservoir permit R2-29935 to store the waters of the White River in Lake Tapps that would be diverted from the river (up to 500 cfs of water, not to exceed a withdrawal of 72,400 af/y) pursuant to application S2-29920 for municipal water supply and related recreational and water quality purposes.
- Surface Water Permit S2-29934 to divert a daily peak rate of 150 cfs and a daily average per year of 100 cfs, not to exceed a withdrawal of 72,400 af/y for municipal water supply and related recreational and water quality purposes.

The permit holder is advised that the quantity of water allocated by this permit is subject to all of the conditions provided herein including the development schedule as provided in 5.2, which provides in part that the permit may be reduced at the time of final certification to reflect system capacity and actual usage. This water right authorization contains a dual construction schedule and provides that by December 31, 2036, Ecology may issue a water right certificate for the quantity of water that has been perfected under the permit for public water supply and a superseding permit for the remaining quantity of water that is reasonably projected to be perfected in the future as public water supply as provided in development schedule.

5.2 Development Schedule

The Development Schedule for the Lake Tapps Water Supply Project sets forth the dates and corresponding conditions that the permit holder must meet for the development of water for public water supply purposes.

We recognize that the permit holder (PSE) has an agreement with CWA under which the parties have agreed that CWA shall have the option to acquire the water right issued under this application, and use it to provide water supply to CWA's members and potentially to other users within the place of use identified in the water right application. Pursuant to that agreement, PSE may have CWA perform the requirements as outlined in this section, in which case CWA shall be bound by the same provisions as are outlined here.

5.2.1 Public Water Supply

The permit holder is required to enter into a binding agreement with CWA, (or another entity that would supply the same entities that comprise the CWA) for purchase of the water or water right associated with this permit. <u>Due within one year from date that the permit becomes a final order no longer subject to appeal.</u>

Within one year after the permit is issued, and following receipt of a binding agreement between PSE and CWA (or other entity), the CWA shall prepare and present a Water System Plan to WDOH in a format and content consistent with State criteria for such plans. The initial Water System Plan, and its updates, shall be consistent with both other state planning requirements and any local or regional planning requirements, including the Public Water System Coordination Act (Chapter 70.116 RCW).

- CWA shall submit a Water System Plan in 2005 to WDOH for approval and shall maintain a current Water System Plan consistent with the WDOH update cycle. The CWA Water System Plan shall be approved by the WDOH prior to CWA's proceeding to construct facilities intended to transmit and use waters from Lake Tapps.

- The plan shall include current and projected demand forecast, adjusted by a current conservation plan that meets adopted State criteria for CWA members, and a supply plan that utilizes both existing sources of supplies, and the projected use of Lake Tapps. In assessing water demand, the plan needs to evaluate other planning processes (such as Growth Management Act [GMA] plans and salmon recovery plans) and regional conservation guidelines (i.e., those developed under the Central Puget Sound Regional Water Resource Management Program), and adjust the demand for water available under other water rights and water that may be available to the permit holder through additional conservation and reuse programs.

- The Water Supply Plan shall outline the potential use of and allocate the supply in the source exchange program as defined in the ROE for the Phase I development. A specific source exchange program consistent with the ROE and Ecology's designations of Priority Surface Waters shall be implemented prior to proceeding with the final design of Phase II.

- The results of the Source Exchange Program, including revisions to the list of Eligible Utilities and Targeted/Priority Surface Waters, and the success of the Program in meeting the goals for improving stream flows for fish and for recovery of various fish populations as described in watershed and regional salmon recovery plans and programs, may be included in the Water Supply Plan or provided as a separate document.

- CWA shall cooperate with and participate in King and Pierce Counties initiated updates to their Coordinated Water System Plans in which use of Lake Tapps is a planned regional supply to meet local government growth plans.

- The water supply project for Lake Tapps Reservoir (the project) shall be developed in two phases. Phase I of the project shall be implemented as follows:
    - Begin construction within 25 years from issuance of the permit
    - Complete construction within 5 years from initiation of construction
    - Proof of appropriation within 15 years from completion of construction

- After the proof of appropriation form has been received for Phase I, Ecology will issue a Certificate of Water Right for the perfected portion of the water right, and a superseding permit for the second phase. Phase II of the project shall be implemented as follows:
    - Begin construction within 25 years from issuance of permit
    - Complete construction within 18 years from completion of construction of Phase I
    - Proof of appropriation, December 31, 2053

<u>Phase I</u>
<u>Begin Construction Date – within 25 years from issuance of permit.</u> Conceptual design of the water treatment plant and transmission facilities for Phase I shall be submitted to Ecology five years prior to beginning the design and site work for the construction of the facilities necessary for the water treatment plant and transmission system.

<u>Pre-Diversion Requirements.</u> Prior to the diversion of water from Lake Tapps for water supply, the permit holder is responsible for completion of the following tasks:

- Development of schedule and procedures for the implementation of the Source Exchange Program. Due within one (1) year of state designation of Priority Surface Waters;
- Execute preliminary agreements as necessary with other utilities and any regional water providers on the shared use of regional transmission facilities. Due within 2 years of permit issuance;

- Submit documentation to Ecology that the tool for predicting MIF violations at the Puyallup River at Puyallup as described in Section 2.3.4.1 has been tested and the performance standard of a false negative (failure to predict a MIF excursion) error rate of less than 10 percent can be met;and
- Construct a tailrace barrier dam designed as required in the FERC license (See 3.7.2).

Complete Construction Requirements. Within five years of starting construction, the permit holder shall complete construction of the Phase I treatment and transmission facilities for the use of public water supply and source exchange required in Phase I. The Completion of Construction Form may be filed once:

- The water treatment plant is completed and the system is physically equipped to treat full Phase I capacity; and
- A transmission system is available in accordance with the Water System Plan, including appropriate agreements to use other entities' transmission systems, is in place, and water may be physically moved.

Proof of Appropriation Requirements. Within 15 years from completion of construction, the permit holder shall submit to Ecology all pertinent information regarding actual use of public water supply and anticipated future use of public water from Lake Tapps Reservoir under this permit. Ecology may issue a water right certificate for the quantity of water that has been perfected under the permit for public water supply and a superseding permit for the remaining quantity of water that is reasonably projected to be perfected by 2053 as public water supply as provided in the initial permit.

If Ecology finds the projections show that the total quantity of water authorized in the permit for public water supply will not be perfected by 2053 and good cause is shown to extend the development of the permit beyond 2053, Ecology shall issue the superseding permit for a period beyond 2053 not to exceed growth and water use projections to 2063.

Issuance of a superseding permit will be contingent on the permit holder providing Ecology with evidence that:

- Entities utilizing project water are in compliance with conservation standards consistent with the most current state guidelines.
- The permit holder has complied with the conditions and terms of the permit including but not limited to the Modified 10(j) minimum flows, the diversion limits, the MIF Compliant Diversion and Fall Drawdown Plan, and the Source Exchange Program.
- Actual use of water and projected demands indicate the need for a superseding permit.
- Permit holder has assessed demand for additional future regional water needs, and, if permit holder deems necessary, has pursued additional water supplies, which may include filing an *Application for Water Right* to address future regional needs.

The superseding permit will include the following:

- Updated existing provisions deemed necessary for water management goals, which, by example, may be water conservation measures and metering requirements.
- Revised demand projections and development schedule. Ecology's evaluation will include but not be limited to a review of the Water System Plan, King and Pierce County Coordinated Water System Plans, updated planning documents such as the Outlook (CPSWSF, 2001), and the existence of water supply contracts between other water purveyors pertinent to the place of use, i.e., Source of Alternative Supply Analysis.
- Ecology will review the quantities committed to the Source Exchange Program and if necessary adjust such quantities, not to exceed the maximum quantities currently stated as available in the Program.

Phase II

The beginning construction date for both phases is the same, as this is the date on which the physical construction of the water treatment plant and transmission system is to have begun. The Beginning Construction form filed with Ecology shall address both construction phases.

Pre-Development Requirements. Prior to beginning with the Phase II design, the permit holder shall file with Ecology an updated list of utilities participating in the Source Exchange Program, including evidence that individual water system plans include provision for participation.

Complete Construction Requirements. The Completion of Construction form may be filed once:

- The water treatment plant is completed and the system is physically equipped to treat full Phase I and Phase II capacity; and
- A transmission system is available in accordance with the Water System Plan, including appropriate agreements to use other entities' transmission systems, is in place, and water may be physically moved.

Begin Use of Water Date. Use of Phase II water may begin if the permit holder has provided written evidence to Ecology that:

- Entities utilizing project water are in compliance with conservation standards consistent with the most current State guidelines.
- The Source Exchange Program, as approved by the Ecology, is being complied with and shall be complied with as required for Phase II.
- Permit conditions are being complied with, including but not limited to the Modified 10(j) minimum flows, the diversion limits, and the MIF Compliant Diversion and the Fall Drawdown Plan.

Proof of Appropriation Requirements. Proof of Appropriation must be demonstrated on or before December 31, 2053, or as provided in the superseding permit. A water right certificate may be issued for that quantity of Phase II Water applied to full beneficial use as of that date. The water shall be considered fully utilized based on the instantaneous withdrawal rate for a maximum day (QI) and the average rate for at least one month (QA) unless otherwise agreed to by the permit holder and Ecology.

5.2.2 Grounds for Extensions of Construction Schedule

The issuance of this water right permit does not constitute a reservation of public water, as provided for under Chapter 173-590 WAC. In issuing this water right permit, it is the intent of the Department of Ecology to allocate adequate water for the purposes of supplying a projected 2053 population located within the Central Puget Sound place of use. The permit holder is responsible for filing for additional water rights to meet water supply needs beyond 2053.

Consideration of any extensions shall require a showing of good cause. Given the length of the development schedule and other factors, it is critical that project tasks and deadlines be timely completed and that any extensions be minimized and well-justified. Factors that Ecology will consider in any future applications for extension shall include but not be limited to:

- The efforts made to accomplish the task for which extension is sought;
- The extent to which the project and project tasks have overall been completed;
- The most current information on future supply and demand;
- The extent to which the task cannot be completed due to reasons beyond the control of the applicant which reasonably could not have been anticipated to avoid the delay; and
- The permit holder’s ability to obtain commitments to convey and purchase specific volumes of water.

5.3 Other Provisions and Conditions

5.3.1 Subject to Existing Rights. This authorization to make use of public water granted by the State of Washington is subject to existing water rights, including any existing rights held by the Tribes or the United States for the benefit of Tribes under treaty or settlement.

5.3.2 Combined Diversion not to Exceed Limits. The combined instantaneous diversion of water from the White River for municipal water supply under this authorization and under the rights PSE claims under claim no. 160822 shall not exceed the limits established for additional purposes under the change decision in the claim; however, in the event that hydropower use is restarted, the combined diversion limit shall be 2,000 cfs, subject to all other conditions of this authorization.

5.3.3 Water Use. The water appropriated under this application shall be used for public water supply. The State Board of Health rules require public water supply owners to obtain written approval from the Office of Water Supply, Department of Health, 1112 SE Quince Street, PO Box 47890, Olympia, Washington 98504-7890, prior to any new construction or alterations of a public water supply system.

The permit holder shall use water under the claim to (1) support recreation and maintain water quality in Lake Tapps, (2) provide sufficient flow for the fish screen facility, (3) maintain flow from Lake Tapps to Bowman Creek, (4) provide flow augmentation pursuant to the Fall Drawdown Plan, and (5) provide water as otherwise may be required to meet the conditions of this permit. This permit is expressly conditioned on the use of water under the claim to satisfy the above uses and the conditions of this permit.

5.3.4 Water Right Transfer. If PSE assigns or otherwise transfers any of the water rights authorized in this permit and/or claim no. 160822, the conditions of this permit that involve the use of water authorized for use pursuant to claim no. 160822 shall remain binding on the holder of this permit and the holder of the claim. By accepting the permit provided by this decision, PSE agrees that this provision is hereby incorporated into claim no. 160822 as a condition of the claim as long as this permit (including any water right based on it) is in existence.

5.3.5 Instream Flow and Ramping Rates. The diversion from the White River for the water permit shall be subject to the following instream flow and ramping rate conditions:

5.3.3a. Instream flows for Diversion. The diversion shall comply with the minimum instream flows set forth in Table 20~~Table 20Table 20~~. Compliance with these minimum instream flows shall begin within 90 days from the date this decision becomes a final order.

Table 20 - White River Minimum Instream Flow Requirements of the Water Supply Project

Month	Minimum Flow at Buckley gage (USGS 12099100)
January	350
February	350
March	350
April	400
May	400
June	400
July	500
August	500
September	500
October	500
November	385/350
December	350

5.3.3b. Ramping Rates for Diversions. Diversions from the White River shall comply with the ramping rates set forth in Table 21~~Table 21Table 21~~. Down-ramping restrictions for diversions from the White River shall apply when flows are 2,000 cfs or less above the diversion dam as measured at the White River near Buckley gage (USGS 12098500). The diversions from the White River shall not cause or contribute to a reduction in flow below the diversion dam as measured at the White River gage below the diversion dam at Buckley (USGS 12099100) or other location as identified by Ecology of 50 percent or more in a given 24 hour period

Table 21 - Ramping Requirements

Season	Daylight Rates	Night Rates
February 16 to June 15	No Ramping	2 inches / hour
June 16 to October 31	1 inch / hour	1 inch / hour
November 1 to February 15	2 inches / hour	2 inches / hour
Daylight is defined as one hour before sunrises to one hour after sunset. Ramping rate shall be calculated at least once every 15 minutes.		

5.3.3c. Ramping Rates for Tailrace Releases. Releases from Lake Tapps through the tailrace shall comply with the ramping rates in Table 21~~Table 21Table 21~~ whenever Puyallup River flows as measured at the Puyallup River at Puyallup gage (USGS 12101500) are 2,500 cfs or less.

5.3.6 MIF Compliant Diversion. During projected MIF shortfalls at the Puyallup River at Puyallup gage (USGS 12101500), the diversion from the White River shall be reduced to the extent necessary to comply with the MIF. Gauging must be maintained to insure that MIF shortfalls are predicted with a false negative error rate of less than 10 percent. The MIF Compliant Diversion mitigation element shall begin when water is first withdrawn from Lake Tapps for the municipal water supply.

5.3.7 Fall Augmentation. For the purpose of avoiding potential adverse effect to spawning fish during the Fall, when the Puyallup River flow is projected to be below the MIF in October, the release from Lake Tapps through the tailrace shall be at least the lesser of 50 cfs or the amount necessary to meet the MIF. When the Puyallup River flow is projected to be below the MIF during the fall drawdown period, the release from Lake Tapps shall be at least the lesser of 300 cfs or the amount necessary to meet the MIF. The fall drawdown period is defined as November 1 until the reservoir reaches winter low pool. Fall Augmentation shall begin when water is first withdrawn from Lake Tapps for the municipal water supply.

5.3.8 Land Conservation. PSE will to conserve land owned by PSE in the White River watershed as an element of the water supply project application process as described in Section 2.3.4.3. .

5.3.9 Notice of Foreseeable Noncompliance. If the permit holder and/or hydropower operator anticipates future noncompliance with the minimum instream flow for the Reservation Reach, or with the MIF Compliant Diversion or Fall Drawdown Plan, and that such noncompliance cannot be reasonably and feasibly avoided, it shall notify Ecology in writing as soon as possible prior to the noncompliance. Such notice shall state the reason for the anticipated noncompliance and identify all efforts to minimize the duration and extent of noncompliance to the greatest extent reasonable and feasible. Filing of such notice does not limit Ecology's authority to issue penalties for noncompliance or to take other enforcement action. Within one week (or such other arrangement accepted by Ecology) of a noncompliance event, the permit holder and/or hydropower water right claimant shall provide Ecology a written report on the noncompliance identifying its extent and duration, any known impacts, the reasons for the noncompliance, and efforts to minimize the extent and duration.

5.3.10 Water Quality Studies. The permit holder shall perform the following water quality studies:

5.3.10a. Lake Tapps Water Quality Study. Beginning within one year of the issuance of the permit, the permit holder shall initiate a three-year study of Lake Tapps water quality to evaluate minimum diversions into and outflows from Lake Tapps that are necessary to maintain water quality in Lake Tapps. The Lake Tapps study shall characterize water quality in the lake, in the discharge from the lake, and general sources of pollution to the lake, with emphasis on nutrients (nitrogen and phosphorus), temperature, dissolved oxygen, fecal coliform, and nuisance aquatic plants, including algae. During this study period, diversions up to the 500 cfs cap are only permitted during the Spring Refill period (March 1st to May 15th) and during planned experimental periods as part of the water quality study during the remainder of the year. Otherwise, the diversion cap shall be 375 cfs. This study will form the basis for the Diversion Minimization Plan set forth in Condition 5.3.11.

5.3.10b. Tailrace Discharge Study. Beginning within one year of the issuance of the permit, the permit holder shall initiate a three-year study of tail-race discharges from Lake Tapps and the adjacent receiving water to evaluate the impact of the discharge on the White River, focusing on temperature and dissolved oxygen during critical flow conditions in mid-to-late summer and early fall.

5.3.10c. Conditions relating to the Lake Tapps and Tailrace Discharge Studies. At least 180 days prior to commencing the studies, the applicant shall submit a Quality Assurance Project Plan (for guidance on preparing QAPPs, see Ecology Publication No. 04-03-030 [Ecology 2004]) for the studies to Ecology for its review and approval. If requested by the permit holder, Ecology will approve an extension of the Lake Tapps and tailrace discharge studies to collect additional data. The study period shall not exceed 5 years. Final reports for the first the Lake Tapps and tailrace discharge studies shall be submitted to Ecology within 180 days after the end of the respective study periods.

5.3.11 Diversion Minimization Plan. Within one year following the deadline for submission of the Lake Tapps water quality study report, the permit holder shall submit for Ecology's approval or modification a diversion minimization plan (DMP) that identifies the minimum diversions from the White River (not to exceed 500 cfs) and outflows from Lake Tapps that are necessary to maintain water quality in Lake Tapps. The DMP shall provide a schedule for diversions and outflows. The objective of the DMP is to avoid unnecessary diversions from the White River for purposes of maintaining water quality. Diversions under the plan shall provide an adequate margin of safety for protection of public health in the waters of Lake Tapps.

The plan shall provide for continuing monitoring of water quality in Lake Tapps and the discharge from the lake to the White River, and provide flexibility for adaptive management, with approval of Ecology, to respond to new information and circumstances to achieve the above objective in conformity with the conditions of the permit. Unless a different timing is otherwise demonstrated in the water quality study, the diversion of 500 cfs shall be limited to the Spring Refill period after the conclusion of the water quality study. The permit holder may from time to time request Ecology to approve changes to the Diversion Minimization Plan in light of new information or circumstances, to the extent that the existing adaptive management process is unable to provide the needed changes. The plan and any changes to it will be approved or modified by Order, subject to appeal to the PCHB. All persons who have commented on the draft of this ROE or participated as parties in an appeal concerning it will be mailed notice of such Orders.

5.3.12 Water Quality Compliance Plan. Within one year of the deadline for submission of the Tailrace Discharge study, the permit holder shall submit to Ecology a water quality compliance plan to achieve the goal of complying with the dissolved oxygen and temperature standards applicable to the White River at the location of the tailrace. The plan shall provide for an adequate period of monitoring to determine the success of the plan in complying with the standard. The plan shall be prepared after submittal of a draft copy with opportunity for comment to the agencies and parties to the 1998 Agreement on the Allocation of the Puyallup River TMDL Reserve Capacity of Biochemical Oxygen Demand (BOD) and Ammonia, and NOAA Fisheries, WDFW, PTI and MIT. Upon receipt of the plan, Ecology may issue an order approving or modifying the plan, and the permit holder shall implement the plan. However, if the permit holder demonstrates to Ecology that it is not reasonable or feasible to fully comply with water quality standards in discharges from Lake Tapps, a use attainability analysis (UAA) or other available regulatory process may be pursued to address such noncompliance to the extent it may be necessary.

5.3.13 Tailrace Barrier. Within two years of the deadline for submission of the water quality compliance plan required in 5.3.12, PSE shall install a tailrace barrier to minimize attraction and block entry of migrating fish to the tailrace discharge. Prior to construction, PSE shall consult with WDFW and NOAA Fisheries with respect to the design of the facility.

5.3.14 Tailrace Leakage. To the extent practical, the permit holder will stop all leakage from the release structure on the reservoir.

5.3.15 Fish Screens. Within two years of the issuance of the permit and prior to the use of any new intake structures, the permit holder shall install fish screens on any water withdrawal structure. The design for such screens shall be approved by WDFW prior to construction. The permit holder shall submit to WDFW for approval or modification a plan for operation and maintenance of such screens and the screens for the existing fish return structure in the canal. Such screens shall be operated and maintained according to the specifications of the plan approved by WDFW.

5.3.16 Settling Basins. The permit holder shall continue to operate the settling basins near the head of the diversion canal to protect water quality in Lake Tapps. The permit holder shall not modify the basins in a manner that substantially reduces treatment (settling) efficiency. Prior to any modifications, the permit holder shall contact Ecology regarding the need for an Engineering Report submittal per WAC 173-240, and obtain all necessary permits, including permits related to Clean Water Act Section 404 if applicable.

5.3.17 Measuring and Reporting Water Use. An approved measuring device shall be installed and maintained for the Lake Tapps Water Supply diversion in accordance with the rule "Requirements for Measuring and Reporting Water Use", Chapter 173-173 WAC.

Water use data shall be recorded daily. The maximum monthly rate of diversion/withdrawal and the monthly total volume shall be submitted to Ecology in digital format by January 31st of each calendar year. Ecology is requiring submittal of daily meter readings to collect seasonal information for water resource planning, management and compliance.

The following information shall be included with each submittal of water use data: owner, contact name if different, mailing address, daytime phone number, WRIA, Permit/Certificate/Claim No., source name, annual quantity used including units, maximum rate of diversion including units:

1. Monthly meter readings including units;
2. Peak monthly flow including units;
3. Department of Health WFI water system number and source number(s);
4. Purpose of use; and
5. Open channel flow or pressurized diversion.

Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.

5.3.18 Conservation. Issuance of this permit is subject to the implementation of the minimum requirements established in the Conservation Planning Requirements, Guideline and Requirements for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology, and Conservation Programs, July 1994, and as revised.

Under RCW 90.03.005 and 90.54.020(6), conservation and improved water use efficiency must be emphasized in the management of the State's water resources, and must be considered as a potential new source of water. Accordingly, as part of the terms of this water right, the applicant shall prepare and implement a water conservation plan approved by WDOH. The standards for such a plan may be obtained from either WDOH or Ecology.

5.3.19 Source Exchange Program. The permit holder shall fully implement and comply with the Source Exchange Program (hereafter Program) as follows:

5.3.19a. Priority Surface Waters.

1. No later than 5 years prior to the commencement of use of water under the permit, the permit holder shall contribute $150,000 (2006 dollars) to Ecology to conduct a study for purpose of identifying and ranking by order of biological need Priority Surface Waters within the POU of the permit that require instream flows/levels to be increased to achieve healthy harvestable fish runs. The scope of the study shall be jointly developed by Ecology and the permit holder; however, Ecology may make final determinations as to the scope of the study in the event of a disagreement. Such study shall identify the likely periods of time, levels of flow, and other conditions that would be beneficial. Such study shall be done in consultation with the permit

holder and utilize to the extent appropriate any assistance or information that may be available from WDFW and the Central Puget Sound Regional Water Resource Management Program. To the extent that funds are left over, Ecology shall apply the money to its evaluation of the Program developed under Section 5.3.18b below or modifications of the Program developed pursuant to Sections 5.3.18c or 5.3.18d below.

2. Within one year of receipt of Ecology's designation of Priority Surface Waters within the POU of the permit, the permit holder shall prepare and submit to Ecology a Program for review and acceptance or modification consistent with the terms of these provisions. Prior to any modification Ecology shall consult with the permit holder. If Ecology does not accept the Program, or requests modifications to the Program that are unacceptable to the permit holder, the parties will act in good faith to resolve their differences. If the permit holder and Ecology are not able to resolve disagreements about the Program within 30 days of Ecology's decision to not accept a condition of the Program, either party may request the matter be submitted to a mutually-selected third-party arbitrator whose decision shall be binding. If the parties are unable to agree on the selection of the arbitrator within 30 days of the request for arbitration, each party shall within 30 days select an arbitrator with technical expertise in the areas in dispute. The two arbitrators shall jointly select a third person to serve on a three party arbitration panel. If the two arbitrators are unable to agree upon the third arbitrator within 30 days, either party may request the Governor's Office to select the third party arbitrator.

3. The Program shall include identification of utilities that are expected to receive water under the permit that withdraw water from an aquifer that is in significant hydraulic continuity with a Priority Surface Water or diverts from a surface water that influences flow in a Priority Surface Water. Wells and surface water diversions of the identified utilities shall be grouped by the extent to which modified use or non-use of such wells or diversions would likely produce biological benefits during times that flows are insufficient and, based on the results of the Ecology study, identify flow levels, periods of time, or other conditions which would indicate that source exchange could provide biological benefits relative to normal operation of those wells or diversions. Lack of infrastructure and the costs and timing of building any needed infrastructure may be factored into the grouping.

In the event the permit holder implements a source exchange project with a utility expected to receive water under the permit prior to water being put to use under the permit, continuation of that project shall be considered use of Program Water. The Program may also contain provisions for utilities within the place of use identified in the permit to participate in the Program through a Source Exchange Contract with the permit holder.

5.3.19b. Volume Commitment and Schedule.

1. Program Water will be available during the first full year water is put to use under the permit or the first full year following Ecology's acceptance of the Program, whichever is later, and will be used as follows:
    i) In Phase I, up to 8-MGD peak supply (QI) or a total annual volume (QA) of 4,500 acre-feet shall be made available for source exchange. Within this QA limit, the permit holder shall achieve during Phase I a minimum level of actual source exchange at the lesser of 4 MGD peak supply for utilities within the POU of the permit or the level of need identified in the Program

for peak supply of utilities that are expected to receive water under the permit in that calendar year. Source exchange water shall be provided based upon the priority of wells and surface water sources set forth in the Program in order to maximize biological benefits.

ii) Following the completion of construction of Phase II, up to 16 MGD peak supply (QI) or a total annual volume (QA) of 11,000 acre-feet shall be available for source exchange. Within this QA limit, upon the commencement of Phase II, the permit holder shall thereafter achieve a minimum level of actual source exchange at the lesser of 8 MGD peak supply for utilities within the POU of the permit or the level of need identified in the Program for peak supply of utilities that are expected to receive water under the permit in that calendar year. Source exchange water shall be provided based upon the priority of wells and surface water sources set forth in the Program to maximize biological benefits.

iii) If the minimum peak supply source exchange levels required in paragraphs i and ii above are not met for the preceding calendar year, the permit holder may not in the subsequent year further increase the instantaneous (QI) or annual use (QA) of water for public water supply (excluding source exchange) beyond the highest levels of instantaneous or annual use for public water supply achieved under the permit in a year in which the minimum source exchange levels were met. This provision does not limit any authority Ecology may have to authorize use of additional water for public water supply or to issue penalties or seek injunctive or any other available relief to enforce these provisions or other provisions of the permit.

2. Program Water (11,000 acre-feet annually) will be "reserved" for the Program.

3. During the superseding permit process as described in the Development Schedule, Ecology may review and adjust the quantities committed to the Program, although the maximum quantities available and minimum levels of use stated above in paragraph 1.i shall not be increased.

5.3.19c. Reporting. By January 31 following the first year in which Program Water is used (and annually thereafter), the permit holder shall provide a report to Ecology that includes:

1. Program status, including compliance with commitments in prior calendar year, participants, wells/surface waters affected, quantities and periods of well and surface water use avoided, etc.
2. Evaluation of Program success in providing maximum biological benefits; and
3. Recommendations for modifications to the Program.

5.3.19d. Modifications to the Program. In addition to the annual report, the permit holder may at any time submit to Ecology written recommendations for modification of the Program. Ecology shall review any recommended modifications to the Program and accept, deny, or modify upon consultation such recommendations within 90 days of receipt thereof. Ecology may initiate any modifications to the program after written notice to and consultation with the permit holder, if Ecology determines that such modifications are necessary to fully implement the above provisions. If Ecology denies, or amends the recommended modifications in a manner that is unacceptable to the permit holder, the parties will act in good faith to resolve their differences. If necessary the parties will submit their differences to third-party arbitration as provided in Section 5.3.19a.2.

5.3.20 Other Monitoring and Reporting Requirements. The permit holder shall comply with additional monitoring and reporting requirements as follows:

5.3.20a. MIF Compliant Diversion Documentation. After the diversion from Lake Tapps for municipal supply purposes is initiated , the permit holder shall submit documentation to Ecology every 5 years to demonstrate that tool for projecting MIF shortfalls at the Puyallup River at Puyallup gage (USGS 12101500) is meeting the performance standard of less than 10 percent false negative error rate**.**

5.3.20b. Streamflow Monitoring. Within two years of the issuance of the permit, the permit holder shall submit to Ecology a plan to install, operate, maintain, and report from streamflow gages necessary to monitor the instream flows and staff gages to monitor the ramping rates required by this permit. The plan shall describe the method of collecting and recording the flow and ramping rate data, and include a provision for periodically providing that data to Ecology, WDFW, NOAA Fisheries, USFWS, USGS, the Puyallup Tribe of Indians, and Muckleshoot Indian Tribe. The permit holder shall prepare the plan after providing a draft and opportunity to comment to Ecology, WDFW, NOAA Fisheries, USFWS, USGS, the Puyallup Tribe of Indians and Muckleshoot Indian Tribe. The plan shall be implemented, including installation and operation of all gages, within one year after approval of the plan by Ecology.

Chapter 173-173 WAC describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition Ecology for modifications of some of the requirements. Installation, operation and maintenance requirements are enclosed as a document entitled "Water Measurement Device Installation and Operation Requirements."

5.3.20c. Annual Mitigation Summary Report. On an annual basis the permit holder shall submit to Ecology a report summarizing and documenting compliance with the various mitigation elements included as conditions of this permit, including but not limited to the diversion minimization plan.

6.0 FINDINGS OF FACT AND DECISION

Upon reviewing the above report, I find all facts, relevant and material to the subject application, have been thoroughly investigated. Furthermore, I find water is available for appropriation and the appropriation as recommended is a beneficial use and will not be detrimental to existing rights or the public welfare.

Therefore, I ORDER a permit be issued under Surface Water Application Number S2-29934, subject to existing rights and the recommended conditions and provisions above, (Section 5 in its entirety), to allow appropriation of public surface water within the place of use and at the point of diversion proposed in this application.

The statutory permit fee for this application is $600.00.

Signed at Olympia, Washington, this _________ day of ________________, 2006.

Thomas Loranger
Water Resources Supervisor
Southwest Regional Office

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